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COMMONWEALTH OF MASSACHUSETTS

SUMMARY OF WATER QUALITY

1982

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anthony d. cortese, commissioner

DIVISION OF WATER POLLUTION CONTROL
thomas c. mcmahon, director

COMMONWEALTH OF MASSACHUSETTS

SUMMARY OF WATER QUALITY

1982

Prepared by

Technical Services Branch

Division of Water Pollution Control

Massachusetts Department of Environmental Quality Engineering

Westborough, Massachusetts

June, 1982

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FOREWORD

This report presents an evaluation of the surface waters of the Commonwealth of Massachusetts. Required by the Clean Water Act of 1977, this report is designed to provide an overview of water quality conditions of river, estuarine and lake waters for which there is an established data base. All major river systems, and a significant number of ponds, lakes, and estuaries have been evaluated as part of the Division of Water Pollution Control's ambient water quality monitoring program. This report compares existing water quality conditions to the assigned water quality classification; indicates the systems with water quality problems; highlights water quality improvements particularly those associated with the Construction Grants Program; and indicates the abatement projects necessary to achieve a water quality classification.

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EXECUTIVE SUMMARY

The quality of the surface waters of the Commonwealth continues to improve significantly as 48% of the total river miles assessed in this 1982 report met their designated water quality classification. For comparison, the 1977 Summary of Water Quality Report indicated that 32% of the river miles assessed met their designated classification and only 26% exhibited Class B water quality. These figures demonstrate the substantial improvements which have occurred within the past five years and amplify the benefits gained from the extensive water pollution control programs of the Commonwealth.

The evaluation of the lakes and ponds of the Commonwealth has accelerated within the past few years. To date, 350 lakes and ponds have been sampled and subsequently classified according to their trophic state. A diagnostic/feasibility program has been implemented which has culminated in several restoration projects. These programs have provided the people of Massachusetts with increased information concerning the water quality of lakes and ponds and have created an avenue for preserving and restoring the integrity of these valuable resources.

Over the past decade, approximately one billion dollars have been expended through the construction grants process for the design and construction of wastewater collection and treatment systems. The funding for these projects has been provided by the United States Environmental Protection Agency, the Commonwealth of Massachusetts, and the individual cities and towns. This program is responsible for major water quality improvements in many waters of the Commonwealth including the Merrimack, Chicopee, Westfield, Connecticut, Millers and Charles Rivers. This improvement is expected to continue in the upcoming decade as the sources of water pollution are increasingly brought under control.

The future water quality programs of the Department of Environmental Quality Engineering will focus upon improving water quality conditions in critical areas and will include: construction of water pollution abatement projects within the limitation of available funding; implementing the most practical control of combined sewer overflows; evaluation of nutrient removal requirements necessary to retard eutrophication; assessment of the effects of toxic substances upon ambient water quality and indigenous biota.

As the water pollution abatement program continues to improve the surface waters of Massachusetts, more attention will be given to the evaluation of both the quantity and quality of groundwater throughout the Commonwealth. Recent discoveries of contaminated public water supply wells in a number of municipalities in Massachusetts has clearly shown that aquifers are not immune from pollution problems such as contamination by industrial wastes and salt water intrusion. A high priority of the Department in the future is to protect the quality of groundwater.

TABLE 1

BASIN WATER QUALITY SUMMARY

RIVER BASIN/ESTUARY	TOTAL MILES ASSESSED	TOTAL MILES ASSESSED MEETING STANDARDS	PERCENT TOTAL MILES ASSESSED MEETING STANDARDS
Assabet River	31.0	0.0	0
Blackstone River	39.3	7.4	19
Tributaries	45.6	28.6	63
Boston Harbor:			
Charles Basin	8.6	0.0	0
Tributaries	4.2	0.0	0
Mystic River	4.6	0.0	0
Tributaries	13.0	0.0	0
Neponset River	29.5	7.9	27
Tributaries	3.1	3.1	100
Weymouth River	9.6	0.0	0
Tributaries	3.2	0.0	0
Chelsea River	3.5	0.0	0
Fort Point Channel	2.1	0.0	0
Harbor Proper*	4	0	0
Buzzards Bay:			
Tributaries	76.7	69.2	90
Estuaries*	8	5	63
Cape Cod:			
Estuaries*	58	35	60
Charles River	69.1	57.3	83
Tributaries	8.8	4.7	53
Chicopee River	17.9	8.7	49
Ware River	40.8	37.9	93
Tributaries	18.2	12.8	70
Quaboag River	24.9	14.1	57
Tributaries	22.7	13.2	58
Connecticut River	67.5	51.6	76
Tributaries	12.4	9.1	73

TABLE 1 (CONTINUED)

RIVER BASIN/ESTUARY	TOTAL MILES ASSESSED	TOTAL MILES ASSESSED MEETING STANDARDS	PERCENT TOTAL MILES ASSESSED MEETING STANDARDS
Deerfield River	42.4	32.5	77
Tributaries	36.8	34.4	93
Farmington River	14.4	14.4	100
Tributaries	11.0	11.0	100
French & Quinebaug Rivers	43.5	13.7	31
Tributaries	26.8	11.1	41
Hoosic River	24.4	7.9	32
Tributaries	15.4	4.6	30
Housatonic River	73.7	13.2	18
Tributaries	10.5	8.6	82
Ipswich River	41.1	32.2	78
Islands*	26	25	96
Merrimack River	49.8	15.6	31
Tributaries	33.3	0.0	0
Millers River	35.7	22.8	64
Tributaries	12.8	3.1	24
Nashua River	50.2	0.0	0
Tributaries	55.3	8.0	14
North Coastal:			
Rivers	28.5	5.5	19
Estuaries*	7	6	86
North River	23.2	15.3	66
South River	10.6	10.6	100
Parker River	22.0	22.0	100
Shawsheen River	25.0	17.4	70
South Coastal:			
Jones River	7.0	0.0	0
Estuaries*	6	2	33
Sudbury & Concord Rivers:			
Sudbury River	32.7	16.5	50
Concord River	15.4	9.3	60
Hop Brook	9.7	0.0	0

TABLE 1 (CONTINUED)

RIVER BASIN/ESTUARY	TOTAL MILES ASSESSED	TOTAL MILES ASSESSED MEETING STANDARDS	PERCENT TOTAL MILES ASSESSED MEETING STANDARDS
Taunton River	40.8	6.5	16
Tributaries	134.1	43.3	32
Ten Mile River	22.6	3.7	16
Westfield River	98.1	65.7	67
Tributaries	7.9	5.9	75

* Estuary segments; not river miles

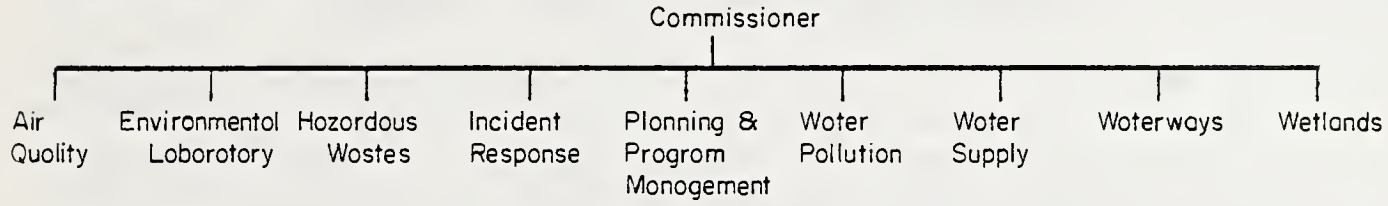
Total miles assessed: 1,611
Total miles meeting standards: 780.4
Percent total miles assessed meeting standards: 48

INTRODUCTION

The waters of the Commonwealth of Massachusetts have been subjected to degradation from various sources such as domestic sewage, industrial chemicals, urban runoff, and atmospheric deposition. Water quality problems were amplified as population increased and industrial development intensified. Often untreated or poorly treated wastewater was disposed into the nearest waterbody with little regard for the quality of the receiving water. The problems associated with wastewater disposal and stormwater runoff have been recognized for decades by members of the scientific community and to varying degrees by the general populace. Stern and expensive measures were necessary to retard and eliminate the degradation of the waters of the Commonwealth. The vehicle to re-establish the quality of the water resources was provided by the landmark legislation passed by Contress in 1972 - the amendments to the Federal Water Pollution Control Act, Public Law 92-500. This act set forth goals and a policy for the attainment of desired water quality across the nation. Most importantly, the act provided funds necessary to finance the vast water pollution abatement projects necessary to achieve and maintain water quality goals.

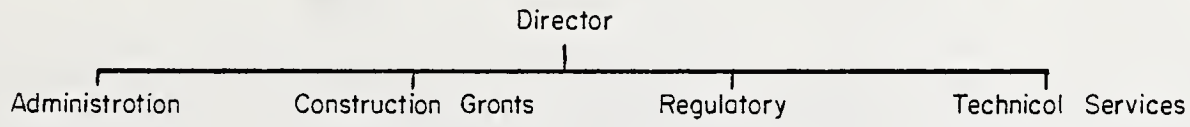
Massachusetts Department of Environmental Quality Engineering

The Department of Environmental Quality Engineering (DEQE) was established in 1975 as a result of a reorganization of the Commonwealth's governmental structure. In its present structure, DEQE is comprised of nine divisions and four regional offices, each with its own responsibilities to the various environmental issues which confront the people of the Commonwealth. A simple organizational chart of DEQE is given below:



Massachusetts Division of Water Pollution Control

The Division of Water Pollution Control, originally established by the Legislature in 1966 and incorporated into DEQE in 1980, has four main branches as indicated below:



One of the legislative mandates to the Division is to periodically monitor the waters of the Commmonwealth and to report on those findings. The Technical Services Branch (formerly named the Water Quality and Research Section) performs ambient water quality monitoring of rivers, lakes and estuaries and conducts sampling of wastewater discharges. The Technical Services Branch is comprised of five main sections: Administration, Water Quality-River, Water Quality-Lakes, Compliance Monitoring and Research & Demonstration. The monitoring program of the Technical Services Branch is designed to provide data which are required to properly evaluate existing water quality conditions and to provide information which is used in the Division's planning process. The various components of the program are:

Intensive Water Quality Surveys - These surveys normally monitor all major components of a river basin system. Included in such a survey are physical parameters such as flow, temperature; chemical parameters such as biochemical oxygen demand and phosphorus; biological parameters such as coliform bacteria, phytoplankton and chlorophyll a. The surveys are often conducted for three 24-hour periods during two weeks of the summer. The data produced from these surveys are tabulated, analyzed, input into a mathematical river model and used to demonstrate water quality improvements. The trend in monitoring is toward site specific evaluations aimed at identifying a single problem.

Biological Monitoring - In 1973, the Division initiated an extensive program of benthic macroinvertebrate sampling with the objectives of: 1) determining

the suitability of aquatic environments for supporting healthy and diverse indigenous communities; 2) providing accurate taxonomic baseline data on benthic organisms for future comparative water quality evaluations; 3) providing data useful in the detection of the presence of hazardous or toxic substances in the aquatic environment, and 4) establishing reliable and consistent methods of data analysis to define the water quality responses of benthic macroinvertebrate communities.

Lakes Monitoring - The Division's Lakes Monitoring Program was formally initiated in the summer of 1974; it was expanded in 1979 with the inception of E.P.A's 314 Program. Two different sampling programs are conducted by the lakes section: baseline surveys and intensive surveys.

A baseline survey consists of bathymetric mapping, qualitative and density mapping of the vascular aquatic plants, chemical, bacteriological and biological sampling of the open water areas. Chemical and bacteriological samples are also taken of the natural inlets and the outlet. The lake is sampled once during the summer months.

Intensive lake surveys consist of a minimum of six surveys conducted during a one-year period with sampling performed in each season. Physical, chemical and biological data are collected during each sampling run as in the baseline surveys. Historical, cultural and soils watershed information are later gathered to supplement the water quality data.

The results of these surveys are necessary to achieve the objectives of the Lakes Monitoring Program. Baseline data are used to classify the lakes and ponds of Massachusetts. This information will aid in developing a comprehensive lake restoration-preservation program and aid in evaluating the impact of shoreline development on these lakes and ponds. To date, lakes and ponds have been classified.

Compliance Monitoring - The National Pollutant Discharge Elimination System (NPDES) was established as part of PL92-500. It requires all dischargers of pollutants to a waterbody to obtain a permit to discharge. A pollution abatement schedule may be established to fulfill the goals of NPDES. Monitoring of these wastewater discharges is required to assure compliance with the terms of the discharge permits and is performed by the Division. This monitoring is coordinated when possible with the sampling of treatment facilities for operation and maintenance purposes and with the water quality sampling to provide data for the mathematical models. Approximately 125 discharges are sampled each year. Discharge samples range from 24-hour composites on major municipal facilities to grab samples on some minor industrial discharges. The parameters for analysis on each sample will depend upon the nature of the discharge and the terms of the discharge permit.

Water Quality Standards

The Division of Water Pollution Control has established water quality standards which provide regulations pertaining to water quality criteria and classification for the riverine and estuarine waters of the Commonwealth.

Standards for the ponds and lakes of the Commonwealth have not been promulgated but may be considered by the Division at a future date. The existing standards, updated in September 1978, are comprised of five parts: 1) General Provisions; 2) Application of Standards; 3) Minimum Water Quality Criteria and Associated Uses; 4) Antidegradation Provision; and 5) Basin Classification and Maps.

The revisions to the standards, completed in 1978, represented a substantial upgrading of river segments to a high water use classification. The upgradings were due to improved water quality resultant from new and improved wastewater treatment facilities and the desire to obtain optimum water use. Appendix 1 of this report contains parts 1-4 of the Standards while the classification for each major river and estuary are given in the individual basin sections.

The standards will be reviewed and if necessary revised by the Division in 1982; the review will address such matters as stormwater overflows, the inclusion of standards for toxicological problems, and seasonal treatment policies.

Water Related Issues

The impact upon water quality is not solely restricted to discharges from domestic and industrial wastewater sources. The dynamic interaction between water and numerous environmental factors produces a wide gamut of issues to be addressed by the Department of Environmental Quality Engineering. As previously mentioned, the Department is comprised of nine Divisions, each of which addresses a major environmental area. All these areas impact upon the quality of the waters of the Commonwealth and some, in turn, are impacted by the waters themselves.

Each of the Divisions perform an integral task in the overall environmental control, evaluation, preservation and implementation programs of the Department. For detailed information on these programs, the individual Divisions should be contacted.

BASIN WATER QUALITY CONDITIONS

The following section will present the water quality of each of 27 basins in the Commonwealth. For each basin, the following will be presented:

- Description of the Watershed
- Water Quality Conditions and Trends
- Lakes and Ponds, Inventory, Intensive Surveys and Classification
- References
- Basin chart including:
    - segment description
    - river miles of segment
    - water use classification
    - standards violation(s)
    - data base year(s)
    - water quality problem(s)
    - source(s) of problem(s)
    - abatement needs to meet classification

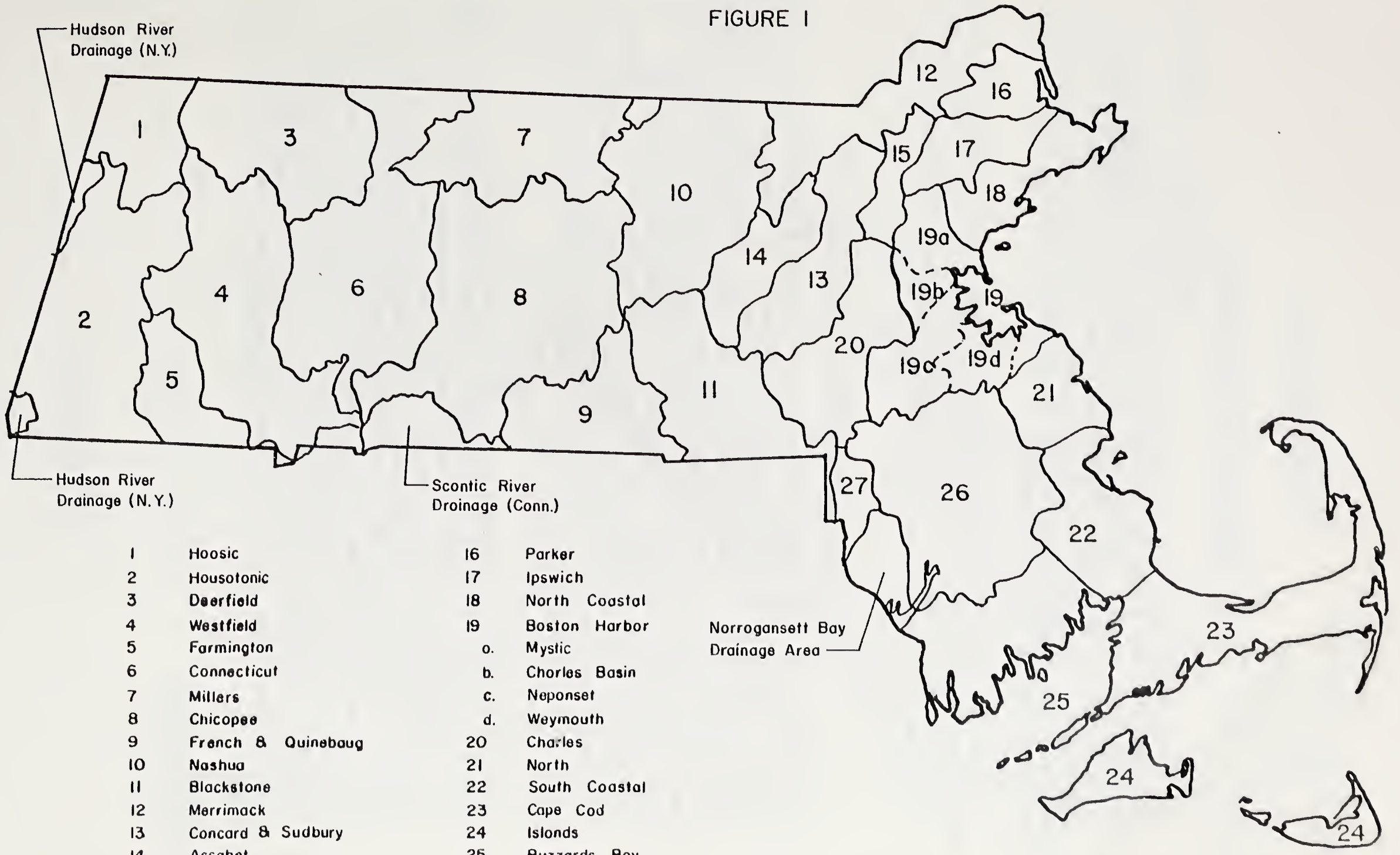
The discussions will highlight water quality improvements; areas of remaining problems; abatement efforts which have been completed, are planned, or are needed; and the overall water quality trends. In some waters, the data base is several years old and some qualitative evaluations have been made in the description of water quality conditions. In Appendix 2, the lakes and ponds classification system is explained. The list of references is provided to list sources for anyone interested in more detailed information.

The 27 basins of the Commonwealth are shown in Figure 1. In the following section, the basins are presented alphabetically rather than in the west-to-east format of Figure 1.

COMMONWEALTH of MASSACHUSETTS

DRAINAGE AREAS

FIGURE 1



1	Hoosic
2	Housotonic
3	Deerfield
4	Westfield
5	Farmington
6	Connecticut
7	Millers
8	Chicopee
9	French & Quinebaug
10	Nashua
11	Blackstone
12	Merrimack
13	Concord & Sudbury
14	Assabet
15	Shawsheen
16	Parker
17	Ipswich
18	North Coastal
19	Boston Harbor
o.	Mystic
b.	Charles Basin
c.	Neponset
d.	Weymouth
20	Charles
21	North
22	South Coastal
23	Cape Cod
24	Islonds
25	Buzzards Boy
26	Taunton
27	Ten Mile

ASSABET RIVER BASIN

Description of the Watershed

The Assabet River has its beginnings in the town of Westborough. It flows northeasterly for 31 miles through the towns of Northborough, Hudson, Maynard, and Concord. The Assabet River drains an area of 175 square miles. It receives the discharges of five municipal wastewater treatment plant discharges. Because of the number of wastewater discharges and the numerous impoundments along its course, the Assabet River does not meet class B water quality standard conditions.

The United States Geological Survey (USGS) maintains a flow gaging station in Maynard with records dating back to 1941. The average discharge at this gage over 40 years of record is 182 cubic feet per second (cfs) while the seven-day ten-year low flow is 4.1 cfs.

Water Quality Condition and Trends

Impoundments and municipal wastewater treatment plant discharges continue to plague the Assabet River as they have done so over the past few decades. Nowhere along the Assabet's 31 miles are class B water quality conditions maintained throughout the year. Intensive sampling programs in 1965, 1969, 1974, and 1979 all document significant dissolved oxygen deficits and excessive fecal coliform counts. Significant stretches of the river support dense populations of algae and macrophytes during the summer months. Decaying vegetation, sediments in impoundments, and anaerobic in-stream conditions have been responsible for complaints of olfactory assault. Seasonal trout stocking in the Assabet River by the Massachusetts Division of Fisheries and Wildlife was discontinued during the early 1970's because of poor water quality conditions.

Progress towards the attainment of improved water quality in the Assabet River has been slow since the enactment of the 1972 Federal Water Pollution Control Act (PL92-500). Current projections are that it will not be until the mid-1980's that upgradings to the basin's municipal wastewater treatment plants will be completed. Included in the upgradings are the combining of the present Westborough and Shrewsbury discharges into one advanced secondary discharge, the upgrading of the Marlborough-Westerly and the Hudson wastewater treatment plants to advanced secondary, and the attainment of reliable secondary treatment at Maynard. The question of nutrient control for the discharges is still open. No improvements in the Assabet River water quality are expected until these upgradings are completed.

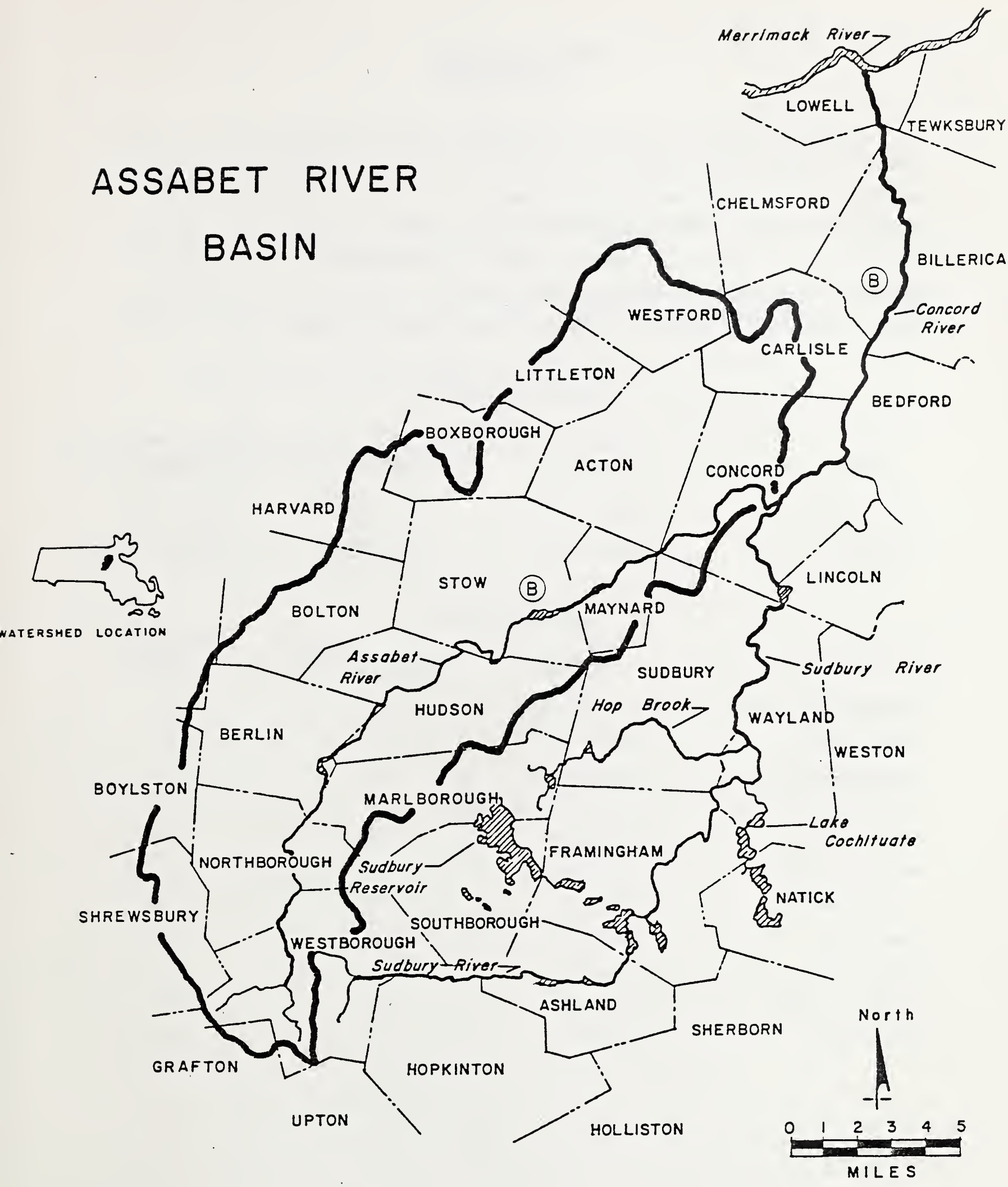

ASSABET RIVER BASIN
WATERSHED LOCATION
Merrimack River
LOWELL
TEWKSBURY
CHELMSFORD
BILLERICA
B
Concord River
WESTFORD
CARLISLE
BEDFORD
LITTLETON
BOXBOROUGH
ACTON
CONCORD
HARVARD
LINCOLN
STOW
B
BOLTON
MAYNARD
Assabet River
SUDBURY
Sudbury River
HUDSON
Hop Brook
WAYLAND
BERLIN
WESTON
BOYLSTON
MARLBOROUGH
Lake Cochituate
FRAMINGHAM
NORTHBOROUGH
Sudbury Reservoir
NATICK
SHREWSBURY
SOUTHBOROUGH
WESTBOROUGH
Sudbury River
ASHLAND
SHERBORN
North
GRAFTON
HOPKINTON
UPTON
HOLLISTON
0 1 2 3 4 5
MILES

FIGURE 2

Lakes and Ponds

Inventory

Number of lakes and ponds	58
Surface area of lakes and ponds (acres)	2,403
Number of lakes and ponds greater than 10 acres	34
Surface area of lakes and ponds greater than 10 acres	2,273
Number of officially recognized Great Ponds	6
Surface area of officially recognized Great Ponds (acres)	353

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Boons Pond	Hudson/Stow	1979-1980	April 1981
Fort Pond	Littleton	1979-1980	February 1981

Classification

Lake	Location	Stratification	Severity Points
Augmentation Pond	Westborough	S	14
Boons Pond	Hudson/Stow	S	11
Chauncey Lake	Westborough	S	6
Fort Meadow Reservoir	Hudson/Marlborough	S	9
Fort Pond	Littleton	S	10
Hocomonco Pond	Westborough	U	9
Little Pond	Bolton	U	2
Long Pond	Littleton	S	8
Rocky Pond	Boylston	S	2
Warner's Pond	Concord	S	10
West Pond	Bolton	S	8

References

Massachusetts Division of Water Pollution Control. 1981 The Sudbury-Concord-Assabet Basin Water Quality Management Plan. Westborough, Massachusetts. 52 pp.

_____. 1979. Assabet River 1979 Water Quality Survey Data. Westborough, Massachusetts. 97 pp.

_____. 1976. Baseline Water Quality Surveys of Selected Lakes and Ponds in the Assabet River Basin 1974. Westborough, Massachusetts. 64 pp.

_____. 1981. Boons Pond Diagnostic/Feasibility Study April 1979-July 1980. Westborough, Massachusetts. 147 pp.

_____. 1981. Fort Pond Diagnostic/Feasibility Study April 1979-August 1980. Westborough, Massachusetts. 98 pp.

TABLE 2

ASSABET RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Outlet of flow Augmentation Pond, Westborough to Westborough WWTP, Westborough	31.0-30.0	B	yes	1979	D.O., coliform bacteria, phosphate	Natural due to Augmentation Pond.	Rehabilitation of Augmentation Pond could help alleviate problem and ease advanced secondary effluent limitations at Westborough WWTP.
Westborough WWTP to outfall of Shrewsbury WWTP Westborough	30.0-29.5	B	yes	1979	D.O., coliform bacteria, ammonia, phosphate, solids	Westborough WWTP.	Upgrade Westborough WWTP; expected completion date is 1985-86; phosphate removal still in question.
Shrewsbury WWTP outfall to Route 20 dam, Northborough	29.5-26.5	B	yes	1979	D.O., coliform bacteria, ammonia, phosphate, solids	Shrewsbury WWTP.	Divert Shrewsbury wastewater to upgraded Westborough WWTP; expected completion date is 1985-86.
Route 20 dam to Marlborough-Westerly WWTP, Marlborough	26.5-24.2	B	yes	1979	D.O., coliform bacteria, phosphate, ammonia, algae and macrophytes	Upstream WWTPs; impoundment.	Upgrading of upstream WWTPs to be completed in 1985-86; removal of thick sediments from impoundment.
Marlborough-Westerly WWTP to Hudson WWTP, Hudson	24.2-16.3	B	yes	1979	D.O., coliform bacteria, phosphate, algae and macrophytes	Marlborough-Westerly WWTP; Urban runoff, impoundment.	Upgrading at Marlborough-Westerly WWTP; rehabilitation of Hudson impoundment; urban runoff management.

TABLE 2 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Hudson WWTP to outlet of Boons Pond, Stow	16.3-12.3	B	yes	1979	D.O., coliform bacteria, algae and macrophytes	Hudson WWTP, runoff, impoundment.	Upgrading at the Hudson WWTP to be completed in the mid-1980's.
Outlet of Boons Pond to Maynard WWTP, Maynard	12.3-6.5	B	yes	1979	D.O., coliform bacteria, macrophytes	Upstream WWTP discharge, runoff.	Upgrading of the Hudson WWTP, to be completed in the mid-1980's.
Maynard WWTP to Concord MCI WWTP, Concord	6.5-2.5	B	yes	1979	D.O., coliform bacteria, nutrients, macrophytes	Maynard WWTP.	Upgrading of the Maynard WWTP including effluent diffuser into receiving impoundment.
Concord MCI WWTP to confluence with Sudbury River, Concord	2.5-0.0	B	yes	1979	D.O., coliform bacteria, nutrient, macrophytes	Upstream WWTP discharge, runoff.	Upgrading of the Maynard WWTP.

Total miles assessed - 31.0
Total miles meeting standards - 0.0

BLACKSTONE RIVER BASIN

Description of the Watershed

The Blackstone River is an interstate stream originating at Worcester's Kettle Brook Reservoir system located in Paxton. Flowing in a general easterly direction, Kettle Brook is joined by Beaver Brook to form the Middle River. Middle River in turn becomes the Blackstone River at the confluence with Mill Brook in Worcester. At this point the river turns to the south-southeast and flows another 29 miles, where it enters Rhode Island. The Blackstone drainage basin covers a total area of 540 square miles. Approximately 328 square miles are located in Massachusetts and drains to streams above tidal water. Additional areas of the Commonwealth drain to streams which join the Blackstone below tidal water; chief among these is the Ten Mile River Basin which is covered in another section.

From the headwaters to the state line, a distance of 44.7 miles the river drops 1,010 feet. Over half of this drop occurs in the first 10 miles, and much of the rest of it is taken up by the many dams along the river. The United States Geological Survey (U.S.G.S.) maintains a flow gage on the Blackstone River in Woonsocket, Rhode Island just below the state line. The average discharge at this gage over 51 years of record is 758 cubic feet per second (cfs) and the seven-day, ten-year low flow is approximately 90 cfs.

Major sub-watersheds within the Massachusetts portion are the Quinsigamond (37 mi^2), the West (27.9 mi^2), the Mumford (58 mi^2), and the Mill (35 mi^2). Other smaller tributaries include: Tatnuck, Beaver, Dark, Ramshorn, Mill, Singletary, Dorothy, Cold Spring, Bacon, Emerson, Bummet, Fox, and Muddy brooks, the Branch and Peters rivers and Quick Stream.

Water Quality Conditions and Trends

From the mid 1800's to the late 1960's and early 1970's water quality in the Blackstone River was degraded to the extent that it was unfit for any uses other than power generation and waste disposal. Problems included greatly elevated coliform counts, solids and nutrients, and severely depressed dissolved oxygen concentrations. Sections of the Mumford River and Mill River were similarly degraded.

The late 1970's to the present have shown great strides in pollution abatement. A report published by this Division in 1971 listed 58 waste discharges to the Blackstone River and its tributaries. This number has been reduced to 16 permitted discharges. Included in this number are two new secondary treatment plants; one in Grafton and one in Uxbridge.

Rutland
West Boylston
Holden
Boylston
Paxton
A
Shrewsbury
Worcester
B
Kettle Brook
B
Quinsigamond R.
Leicester
B
Grafton
Auburn
Millbury
C
Blackstone R.
Upton
West R.
B
B
Northbridge
Sutton
Hopedale
Mendon
B
B
Mumford R.
Mill R.
Bellingham
Douglas
Uxbridge
Millville
Peters R.
Blackstone
B
MASS.
R.I.
N
0 1 2 3 4 5
MILES
BLACKSTONE RIVER BASIN

FIGURE 3

Despite these improvements many areas of the river are still not meeting the assigned classifications. Problems start shortly downstream from the Waite Pond Dam. Worcester Spinning and Finishing Company operates a treatment facility to handle their textile process wastes. While treatment is good, effluent volumes are high compared to stream flow causing color, D.O., and nutrient problems. These problems are further aggrevated by untreated sanitary discharges throughout the Cherry Valley Section of Leicester. Water quality improves and remains at its B classification through Worcester except for stormwater runoff problems (being studied) and problems from the Mill Brook combined sewer. The overflow from Mill Brook is continuous but is scheduled to be tied into the Upper Blackstone Water Pollution Abatement District Wastewater Treatment Facility (UBWPAD-WWTF). Excess stormwater flows will be handled by a stormwater detention and chlorination plant to be on line by 1985.

One of the major problems on the Blackstone River is the sheer volume of the UBWPAD-WWTF discharge. Most days find the discharge flow to be close to or greater than the river flow. While the UBWPAD plant is producing good secondary effluent or better, the river tends to take on the characteristics of the effluent due to volume. The major impact appears to be deoxygenation caused by nitrification of the large amounts of ammonia-N discharged by the UBWPAD. Other past problem areas have greatly improved. Many of the raw sanitary discharges in South Grafton have been tied into the new Grafton Treatment Facility. Likewise the Uxbridge plant has picked up the discharges in Uxbridge center and the Emile Bernat discharge.

A new area of concern is the toxicity of the sediments below Worcester. Years of waste disposal have created large deposits of sediment from Millbury to Uxbridge. Recent studies have shown these sediments to be ladened with cadmium, chromium, nickel, lead, tin, and zinc. The public health impacts of this condition are not known at present. This situation should, however, preclude any contact type of recreation until further investigation is finished.

For the most part all tributary streams meet their assigned classification. Minor problems on the Mumford River have improved due to improved treatment at the Hayward Schuster plant. Problems from Emile Bernat and untreated sanitary discharges in North Uxbridge have been alleviated by sewering to the Uxbridge WWTF on the Blackstone River. Some problems still exist from the outdated treatment plant at Hopedale. These problems will soon be corrected by the construction of a new advanced secondary treatment facility at the site of the old plant.

Many of the tributaries support a wide variety of uses. The upper reaches of the Blackstone (Tatnuck and Kettle Brooks) are used as the major source of Worcester's water supply. Most of the tributaries support at least warmwater fisheries and many are stocked trout waters. The West River is used extensively for fisheries and also has a recreation area (swimming/picnicking). The U.S. Army Corps of Engineers maintains a dam on this river for the purpose of flood control. The lower portion of the Mill River (Harris Pond) is used as an emergency water supply for the city of Woonsocket, Rhode Island.

Lakes and Ponds

Inventory

Number of lakes and ponds	183
Surface area of lakes and ponds (in acres)	6,993
Number of lakes and ponds greater than 10 acres	107
Surface area of lakes and ponds greater than 10 acres	6,615
Number of officially recognized Great Ponds	8
Surface area of officially recognized Great Ponds (in acres)	2,060

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Dorothy Pond	Millbury	1981-1982	*
Flint Pond (North & South)	Grafton/Shrewsbury	1979-1981	**
Indian Lake	Worcester	1975-1976	December 1978
Lake Quinsigamond	Worcester/Shrewsbury	1979-1981	**

Classification

Lake	Location	Stratification	Severity Points
Bell Pond	Worcester	U	6
Brierly Pond	Millbury	U	9
Coes Reservoir	Worcester	U	10
Cook Pond	Worcester	U	9
Crystal Lake	Douglas	U	8
Dark Brook Reservoir	Auburn	U	10
Dorothy Pond	Millbury	U	9
Eddy Pond	Auburn	U	8
Flint Pond (North & South)	Grafton/Shrewsbury	U	9

* Study in progress
**Publication in progress

Lake	Location	Stratification	Severity Points
Green Hill Pond	Worcester	U	7
Indian Lake	Worcester	S	9
Jordan Pond	Shrewsbury	U	11
Lackey Pond	Uxbridge/Northbridge	U	12
Manchaug Pond	Douglas/Sutton	S	3
Nipmuc Pond	Mendon	S	6
Patch Pond	Worcester	U	8
Pondville Pond	Auburn/Millbury	U	11
Lake Quinsigamond	Worcester/Shrewsbury	S	11
Ramshorn Pond	Millbury/Sutton	S	3
Salisbury Pond	Worcester	U	10
Singletary Pond	Worcester	S	10
Stoneville Reservoir	Auburn	U	5
Waite Pond	Leicester	U	5
Wallum Lake	Douglas/Burrillville, R.I.	S	2

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TABLE 3

BLACKSTONE RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Blackstone River from Waite Pond, Leicester to Curtis Pond, Worcester.	59.3-51.3	B	yes	1977 1980	Color Solids Coliform Nutrient	Worcester Spinning and Finishing. Cherry Valley sewer discharge.	Sewer this area to the UBWPAD-WWTP Leicester WWTP.
Curtis Pond to American Steel Dam, Worcester	51.3-48.8	B	yes	1977 1980	Solids Coliform	Urban runoff.	Stormwater detention and chlorination project underway.
American Steel Dam to Fisherville Dam, Grafton	48.8-39.8	C	yes	1977 1980	D.O. Solids Coliform Nutrients	Mill Brook. UBWPAD-WWTF. Millbury STP.	Combined sewer separation in Worcester. Upgrade UBWPAD to AST. Correct industrial user problems in Worcester and Millbury (minor).
Fisherville Dam to Rice City Pond, Uxbridge	39.8-31.1	B	yes	1977 1980	D.O. Nutrients Algae	UBWPAD-WWTF. Nitrification.	Upgrade UBWPAD-WWTP to AST.
Rice City Pond to Water Quality Monitor, Millville	31.1-23.7	B	no	1977 1980	--	--	--
Water Quality Monitor to state line, Blackstone-Woonsocket, RI	23.7-20.0	B	yes	1977 1980	Coliform Nutrients	Sanitary discharges in Blackstone.	Sewering of Blackstone to Woonsocket underway.
Quinsigamond River, entire length	5.3-0.0	B	no	1977 1980	--	--	--

TABLE 3 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Mumford River, entire length	14.5-0.0	B	no	1977 1980	--	--	--
West River, entire length	8.8-0.0	B	no	1977 1980	--	--	--
Mill River, entire length	11.0-0.0	B	yes	1977	Coliform D.O. Solids Nutrients	Hopedale STP.	Upgrade to AWT.
Mill Brook, entire length	3.0-0.0	B	yes	1977 1980	D.O. Solids Coliform pH Nutrients	Combined sewer.	Separate combined sewers.
Tatnuck/Beaver Brooks, entire length	3.0-0.0	B	yes	1977 1980	D.O. Solids Coliform pH Nutrients	Combined sewer.	Separate combined sewers.

Total miles assessed (Blackstone River) - 39.3
Total miles meeting standards (Blackstone River) - 7.4

Total miles assessed (tributaries) - 45.6
Total miles assessed (tributaries) - 28.6

BOSTON HARBOR DRAINAGE

The Boston Harbor watershed includes the Charles Basin, the Mystic River Basin, the Neponset River Basin, the Weymouth River Basin, and Boston Harbor. Each component of the Boston Harbor Drainage is described and evaluated in its own section within this chapter.

The Charles Basin

Description of the Watershed

The Charles Basin is bounded at its upstream end by the Watertown Dam, and at its downstream end by the Charles River Dam at Science Park. The Charles River in the Charles Basin is 8.6 miles long and has a net drainage area of 39 square miles (the entire Charles River drains 307 square miles). The only tributary to the Charles Basin is the Back Bay Fens, which includes the Muddy River and Stony Brook.

The Charles Basin watershed includes areas of Boston, Brookline, Cambridge, Newton and Watertown. Its value to the Greater Boston area includes recreation sailing and rowing and aesthetics. The Metropolitan District Commission maintains bicycle paths along the basin's banks which are widely used.

The Back Bay Fens is an undeveloped park area. The Fens had been a salt marsh before the Back Bay was filled in and the Charles River was impounded. The Fens area houses the Museum of Fine Arts, the Gardner Museum and Fenway Park.

Water Quality Conditions and Trends

Problems in the Charles Basin stem largely from combined sewer overflows and salt water intrusion of the impoundment. The salt water stratifies and isolates the sediments from the fresh water, causing low oxygen levels near the bottom. The basin receives combined sewer inputs which add to the sediments and cause coliform violations.

The Back Bay Fens and Muddy River suffer from similar problems. They both receive combined sewer inputs, and have sediments which deplete the dissolved oxygen as they stabilize.

Abatement plans for the Charles Basin include control of combined sewer overflows, flow augmentation in the Muddy River and dredging of sediments in the Back Bay Fens.

BOSTON HARBOR
BASIN
WILMINGTON
READING
WAKEFIELD
BURLINGTON
WOBURN
STONE-
HAM
LEXINGTON
WINCHESTER
MELROSE
MEDFORD
MALDEN
MYSTIC R.
REVERE
ARLINGTON
EVERETT
CHELSEA
BELMONT
SOMER-
VILLE
CAMBRIDGE
WINTHROP
WATERTOWN
CHARLES R.
NEWTON
BROOKLINE
BOSTON
HULL
DEDHAM
QUINCY
MILTON
WESTWOOD
WEYMOUTH
BACK R.
COHASSET
WEYMOUTH
FORE R.
HINGHAM
NEPONSET R.
BRAINTREE
WEYMOUTH
SCITUATE
NORWOOD
CANTON
RANDOLPH
NORWELL
ROCKLAND
WALPOLE
HOLBROOK
STOUGHTON
AVON
SHARON
ABINGTON
A
B
C
SA
SB
SC
N
0 1 2 3 4 5
Miles

FIGURE 4

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TABLE 4-A

BOSTON HARBOR DRAINAGE

Charles Basin

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Charles Basin from Watertown Dam to the Charles River Dam, Boston.	9.8-1.2	C	yes	1974 1976 1977	Intermittent coliform Dissolved oxygen	Combined sewer overflows. In-place sediments and salt water intrusion.	Combined sewer separation. Destratification by mixing.
Back Bay Fens from the Muddy River to confluence with the Charles Basin, Boston	1.5-0.0	C	yes	1974 1982	Coliform Dissolved oxygen	Combined sewer overflows. In-place sediments and combined sewer overflows.	Combined sewer separation. Dredging of sediments.
Muddy River from Jamaica Pond to the Back Bay Fens, Boston	2.7-0.0	B	yes	1974 1982	Coliform Dissolved oxygen	Combined sewer overflows.	Combined sewer separation.

Total miles assessed (Charles Basin) - 8.6
Total miles meeting standards (Charles Basin) - 0.0

Total miles assessed (tributaries) - 4.2
Total miles meeting standards (tributaries) - 0.0

The Mystic River Basin

Description of the Watershed

The Mystic River drains 69 square miles and is 17 miles in length. It runs through a watershed characterized by a high degree of urbanization in the north section of Greater Boston area. Much of the basin is highly developed with considerable industrial and commercial activity.

The headwaters of the Mystic include the Aberjona River and Hall's Brook. Horn Pond Brook in Woburn, Mill Brook in Arlington, and Alewife Brook in Cambridge all contribute to the flows in the middle Mystic River.

The Upper and Lower Mystic Lakes are found in the middle basin. They are both used for recreation on a limited basis. Nutrients supplied by the Aberjona River cause the Upper Mystic Lake to be eutrophic. Lower Mystic Lake, found to the south, is fed by Upper Mystic Lake and Mill Brook. In 1966, the Amelia Earhart Dam was built to prevent salt water intrusion into the lake.

The outlet of the Lower Mystic Lake is recognized as the beginning of the Mystic River. It flows in a southeasterly direction, is joined by the Malden and Chelsea rivers and discharges to Boston Harbor.

Water Quality Conditions and Trends

Severe water quality problems continue in the Aberjona River, which affect the Mystic River as well. Toxic chemicals and ammonia leach into the Aberjona River in Woburn and Wilmington from abandoned disposal sites and chemical lagoons. Combined sewer overflows in Stoneham contribute to the coliform violations. Intense study is underway to investigate the problems in the Aberjona River.

The Lower Mystic Lake experiences high nutrient loads from the Aberjona River. Algae blooms cause aesthetic and dissolved oxygen problems. A saline layer along the bottom cause anoxic conditions and high sulfide problems. The Upper Mystic Lake has eutrophication problems caused largely by the inflow, the Aberjona River.

Combined sewer overflows contribute to problems in Alewife Brook. Urban runoff also degrades this river.

The tidal portion of the Mystic River has coliform, and oil and grease problems resulting from combined sewer overflows and the heavy water traffic in this area.

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TABLE 4-B

BOSTON HARBOR DRAINAGE

Mystic River Basin

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Aberjona River from its source in Reading to Upper Mystic Lake, Winchester	18.4-9.2	B	yes	1975 1976 1977 1978 1981	Ammonia Coliform Dissolved oxygen Metals	Leachate. Combined sewer overflows.	Toxic element control and clean up. Elimination of CSO in Stoneham.
Aberjona River from Upper Mystic Lake to Lower Mystic Lake, Medford-Arlington	9.2-7.4	B	yes	1975 1976 1978 1981	Ammonia Coliform Dissolved oxygen Aesthetics	Inflow from Aberjona River. Eutrophication saline layer.	Abatement project in progress to correct saline layer problem.
Alewife Brook from Fresh Pond Cambridge to confluence with the Mystic River, Arlington-Somerville	2.0-0.0	B	yes	1975 1976 1978 1981	Coliform Ammonia Dissolved oxygen	Combined sewer overflows.	Combined sewer separation.
Mystic River from Lower Mystic Lake to Amelia Earhart Dam, Somerville	4.6-2.0	B	yes	1975 1976 1978 1981	Coliform Ammonia	Combined sewer overflows. Saltwater intrusion.	Combined sewer separation.
Mystic River from Amelia Earhart Dam to confluence with Chelsea River, Chelsea-Boston	2.0-0.0	SC	yes		Coliform Oil and Grease	Combined sewer overflows.	Combined sewer separation.

Total miles assessed (Mystic River) - 4.6
Total miles meeting standards (Mystic River) - 0.0

Total miles assessed (tributaries) - 13.0
Total miles meeting standards (tributaries) - 0.0

The Neponset River Basin

Description of the Watershed

The Neponset River Basin borders the city of Boston on the north and Quincy on the south; it drains a watershed of 123 square miles. The river flows to Dorchester Bay after traveling approximately 30 miles.

The East Branch is the major tributary to the main stem Neponset. Mother Brook, a man-made diversion, conveys one-third of the Charles River flow to augment low flows in the Neponset.

Most of the Neponset River is a fresh water stream. However, after being impounded in Milton by the Walter Baker Dam, the river becomes tidal.

Water Quality Conditions and Trends

Water quality problems in the Neponset River Basin are typical of urban rivers. The river receives combined sewer overflows at numerous points which cause the coliform violations. The river is impounded many times, and the high nutrient loads create eutrophic conditions. The algal productivity, in turn, cause diurnal oxygen variations, which drop below the 5.0 mg/1 standard in the pond off South Street in Walpole.

The Metropolitan District Commission's study of combined sewer discharges to the Neponset estuary recommend sewer separation, which would abate water quality problems in the estuary.

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TABLE 4-C

BOSTON HARBOR DRAINAGE

Neponset River Basin

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Neponset River from Neponset Reservoir, Foxborough to USGS gage, Norwood	29.5-19.1	B	yes	1977 1978	Periodic coliform. Diurnal oxygen in impoundments.	Eutrophication.	--
Neponset River from USGS gage to confluence with East Branch, Canton	19.1-15.8	B	yes	1977 1978	Coliform	Urban runoff.	--
Neponset River from the East Branch to confluence with Mother Brook, Boston	15.8-7.9	B	no	1977 1978	--	--	--
Neponset River from Mother Brook to Milton Lower Falls Dam, Milton-Boston	7.9-4.2	B	yes	1977 1978	Coliform	Combined sewer overflows.	Combined sewer separation.
Neponset River from Milton Lower Falls Dam to Dorchester Bay, Boston-Quincy	4.2-0.0	SB	yes	1978	Dissolved oxygen Coliform	Combined sewer overflows.	Combined sewer separation.
Mother Brook from Mother Brook Dam, Dedham to confluence with Neponset River	3.1-0.0	B	no	1976	--	--	--

Total miles assessed (Neponset River) - 29.5
Total miles meeting standards (Neponset River) - 7.9

Total miles assessed (tributaries) - 3.1
Total miles meeting standards (tributaries) - 3.1

The Weymouth River Basin

Description of the Watershed

The Weymouth Fore River drains portions of the communities of Holbrook, Avon, Brockton, Randolph, Milton, Quincy, Braintree, and Weymouth. The river is approximately 12 miles in length. The headwaters are referred to as the Cochato River, the middle portion is called the Monatiquot River, and the lower tidal portion is known as the Weymouth Fore River. The river discharges into Hingham Bay. The area drained by the Weymouth Fore is 42.25 square miles.

The Weymouth Back River drains an area of 26.5 square miles and includes portions of the towns of Weymouth, Hingham, Holbrook, Braintree, and Rockland. Two tributaries form the headwaters of the Weymouth Back River. They are the Old Swamp River and the Mill River.

Water Quality Conditions and Trends

The limited data available for the Weymouth Rivers Basin indicate coliform violations through much of the basin. These violations occur largely from urban runoff and on-site septic system failures. Sewer extension projects are in progress for the towns of Hingham, Braintree, Weymouth and Quincy.

Dissolved oxygen violations in the Monatiquot River result from urban runoff in the Braintree metropolitan area.

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TABLE 4-D

BOSTON HARBOR DRAINAGE

Weymouth River Basin

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Monatiquot River from source to Weymouth Fore River, Braintree	8.3-5.1	B	yes	1975	Dissolved oxygen Coliform	Urban runoff. Septic system failure.	Sewer extensions to Metropolitan Sewerage District in progress.
Weymouth Back River from Whitmans Pond to Fresh River, Weymouth	4.5-3.2	B	yes	1975	Coliform	Urban runoff. Septic system failure.	Sewer extensions to Metropolitan Sewerage District in progress.
Weymouth Back River from the Fresh River to Hingham Bay, Weymouth-Hingham	3.2-0.0	SB	yes	1973	Coliform	Urban runoff. Septic system failure.	Sewer extensions to Metropolitan Sewerage District in progress.
Weymouth Fore River from Monatiquot River to Hingham Bay, Weymouth-Quincy	5.1-0.0	SB	yes	1970 1973	Coliform	Urban runoff. Septic system failure.	Sewer extensions to Metropolitan Sewerage District in progress.
Weir River from source in Hingham to Hingham Bay	--	SB	unknown	None	--	--	--
Hingham Harbor	--	SA	no	1970		--	--

Total miles assessed (Weymouth River) - 9.6
Total miles meeting standards (Weymouth River) - 0.0

Total miles assessed (tributaries) - 3.2
Total miles meeting standards (tributaries) - 0.0

Boston Harbor

Description of the Watershed

Boston Harbor includes areas of Boston, Quincy, Hull and Chelsea. It extends from the Chelsea River, the Charles River Dam, Hingham Bay and the confluence of the Neponset River with Dorchester Bay to a line connecting the Boston Lighthouse to Deer Island in Boston and Point Allerton in Hull. The harbor includes Fort Point Channel, the Chelsea River, Dorchester Bay (5,000 acres), Quincy Bay (7,000 acres), Hingham Bay (7,000 acres) and Hull Bay. Twenty-two of 28 islands in the Harbor Islands State Park lie within the area described here.

Water Quality Conditions and Trends

Existing water quality data indicate noncompliance with the water quality standards in all segments of the harbor. Urban water quality problems contribute to violations of aesthetics and oil and grease from the heavy water traffic in the port and debris. Combined sewer overflows around the harbor are proposed to be treated and discharged.

Discharges from the Nut Island and Deer Island WWTP's may receive a waiver of secondary treatment under § 301(h) of PL92-500/PL95-217. The Moon Island WWTP's unchlorinated discharge adds to the coliform violations.

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TABLE 4-E

BOSTON HARBOR DRAINAGE

Boston Harbor

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Nantasket Roads (Outer Harbor)	—	SB	unknown	None	--	--	--
President Roads (Outer Harbor)	--	SB	yes	1972	Coliform Metals	Discharges from Deer Island and Nut Island WWTPs. Combined sewer overflows.	301(h) waiver or secondary treatment requirement. CSO treatment proposed.
Inner Harbor	--	SC	yes	1972 1978	Metals Coliform Aesthetics Oil and grease Dissolved oxygen	Combined sewer overflows. In-place sediments. Debris. Water traffic.	CSO treatment proposed.
Fort Point Channel	2.1-0.0	SC	yes	1972	Metals Coliform	In-place sediments. Combined sewer overflows.	CSO treatment proposed.
Chelsea River from source to confluence with Inner Harbor	3.5-0.0	SC	yes	1972 1978	Coliform Oil and grease Metals Dissolved oxygen	In-place sediments. Combined sewer overflows. Water traffic.	--
Dorchester Bay	--	SB	yes	1968 1972	Coliform	Combined sewer overflows.	

TABLE 4-E (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Quincy Bay	--	SA SB	Unknown yes	None None	-- Periodic coliform	-- Moon Island & Nut Island discharges.	-- 301(h) waiver or secondary treatment requirement
Hingham Bay	--	SB	Unknown	None	--	--	--
Hull Bay	--	SB	Unknown	None	--	--	--

Total miles assessed - 5.6
Total miles meeting standards - 0.0

Lakes and Ponds

Inventory

Boston Harbor Drainage Area	BOSTON HARBOR	MYSTIC RIVER BASIN	NEPONSET RIVER BASIN	WEYMOUTH RIVER BASIN	CHARLES BASIN	TOTAL
Number of lakes and ponds	13	44	65	22	22	166
Surface area of lakes and ponds (in acres)	573	1,473	1,893	1,083	370	5,392
Number of lakes and ponds greater than 10 acres	9	20	26	10	9	74
Surface area of lakes and ponds greater than 10 acres	549	1,345	1,700	1,029	324	4,947
Number of officially recognized Great Ponds	--	2	2	1	3	8
Surface area of officially recognized Great Ponds (in acres)	--	124	43	210	125	502

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Spy Pond	Arlington	1980-1981	*
Upper Mystic Lake	Winchester/ Arlington/Medford	1981 1974-1975	* September 1975
Whitman's Pond	Weymouth	1980-1981	*

* Publication in progress

Lake	Location	Classification: Stratification	Severity Points
Cranberry Pond	Braintree	U	7
Halls Pond	Brookline	U	15
Horn Pond	Woburn	S	10
Leverett Pond	Brookline	U	9
Lower Mystic Lake	Arlington/Medford	S	15
Massapoag Pond	Sharon	S	7
Sargent Pond	Brookline	U	10
School Pond	West Roxbury	U	11
Spy Pond	Arlington	S	16
Straits Pond	Cohasset/Hull	U	9
Sunset Lake	Braintree	S	8
Upper Mystic Lake	Winchester/Arlington/ Medford	S	15
Walker Pond	Watertown	U	9
Whitman's Pond	Weymouth	S	10
Willow Pond	Brookline	U	7

BUZZARDS BAY BASIN

Description of the Watershed

The Buzzards Bay Basin is formed by seven major coastal river basins which discharge their waters to the Massachusetts coastline from Bourne to Westport. The Cape Cod Canal determines the eastern border of the basin, while the Rhode Island state line defines the western border. From east to west, the major river basins are: Agawam, Wankinco, Weweantic, Mattapoisett, Acushnet, Paskamanset/Slocums, and Westport. The Buzzards Bay Basin has an approximate drainage area of 350 square miles.

Geologically, the Buzzards Bay Basin is characterized as a low granitic upland with glacial till and outwash deposits forming the soils. The terrain can be described as low and gently rolling, with elevations ranging from slightly more than 200 feet in the hilly northernmost portions of the basin to sea level at the coastline. The minimal elevation change in the basin accounts for the meandering nature of most of the rivers.

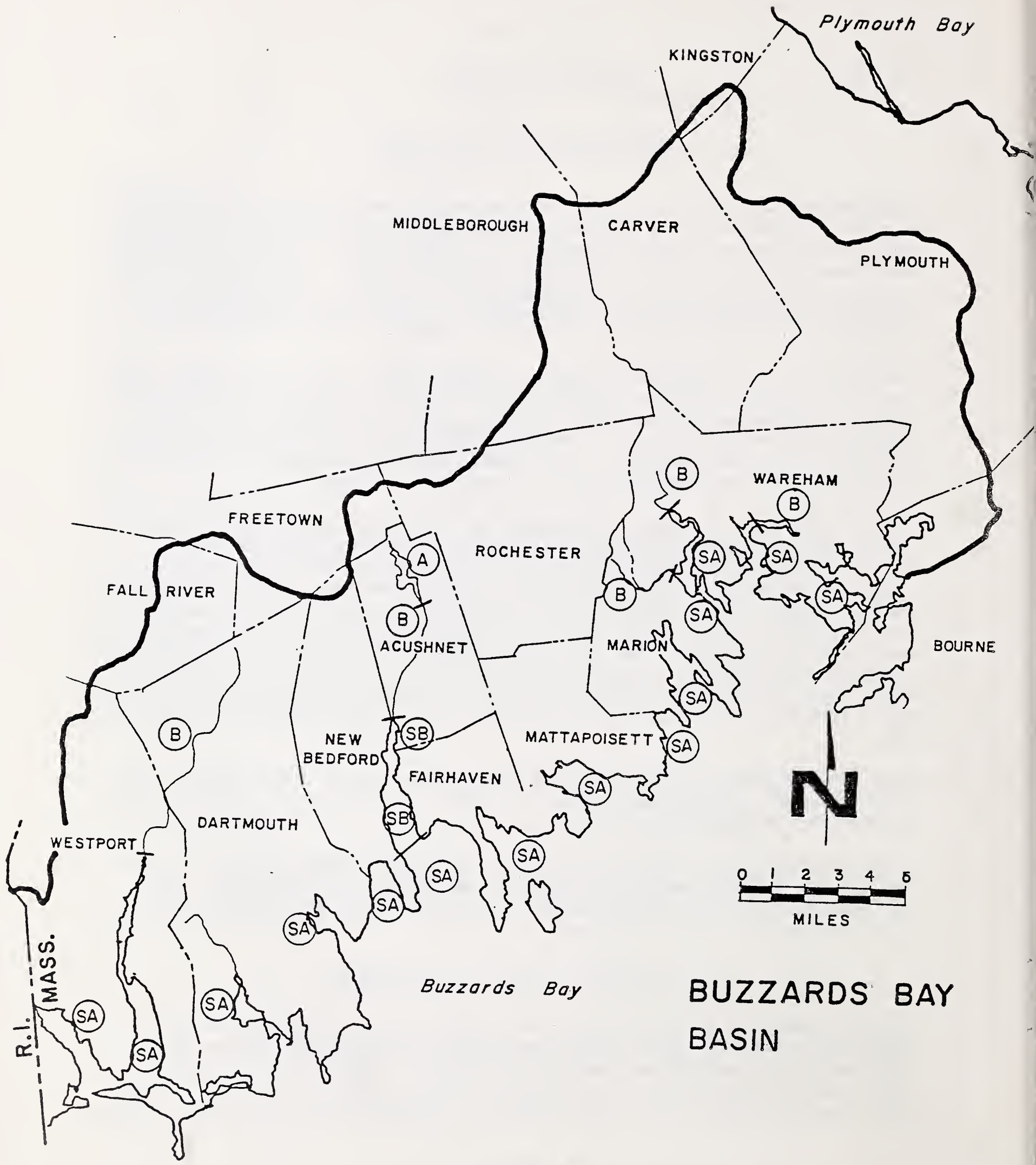
The straight-line distance of the Buzzards Bay coastline is 32 miles, but its actual total length is 210 miles when all the unconformities are accounted for. The numerous harbors and coves formed by the jagged coastline are used extensively for recreational and commercial purposes. New Bedford Harbor, which is famous for its whaling history, is the industrial and commercial center of the basin and, in turn, suffers the most severe water quality problems. The problems plaguing other harbors within Buzzards Bay include discharges of sanitary wastes from municipal collection systems and from watercraft. Oil pollution from the on-shore terminals and the off-shore tankers is a problem that is common to the entire coastline of Buzzards Bay.

With the exception of the Acushnet River and New Bedford Harbor area, industrial wastewater discharges are few in number and have little impact on the quality of the receiving waters.

There are five major municipal wastewater treatment plants serving the communities of Wareham, Marion, Fairhaven, New Bedford, and Dartmouth. The New Bedford facility provides primary treatment, while the remaining plants offer at least secondary treatment.

Water Quality Conditions and Trends

The most recent intensive water quality survey of the entire Buzzards Bay Basin was in 1975 at which time 61 monitoring stations were sampled in accordance with established sampling procedures. Since 1975, the major water quality monitoring has been centered in the area of New Bedford Harbor, both inner and outer, due to the presence of polychlorinated biphenyls (PCB's)



BUZZARDS BAY BASIN

FIGURE 5

and the requested waiver of secondary treatment at the New Bedford WWTP. In addition, compliance monitoring has been conducted several times at the major municipal WWTP's.

Analysis of the 1975 survey data indicates that the overall quality of the streams, rivers and estuaries meets the assigned classification. There are a few localized exceptions and the extreme water quality problems in the Acushnet River and New Bedford Harbor. These areas are impacted by industrial discharges, combined sewer and stormwater overflows, waste water treatment plant, and the presence of residual PCB's. The issue of PCB contamination has been the focus of significant investigation by DEQE, other state agencies and private consultants. The area has been closed (or restricted to certain species) to shellfishing and some forms of finfishing. The PCB problem has brought significant scientific investigation and considerable litigation. The area is under consideration for federal funding to alleviate toxic areas.

The only significant problem with the five major wastewater treatment facilities in the basin is with the New Bedford WWTP. The facility is a primary treatment system which has considerable operational and hydraulic overloading problems. The facility has applied for a waiver of secondary treatment which, if granted, will allow for the continuance of primary treatment with the extension of outfall approximately five miles into Buzzards Bay. The decision on the waiver is pending final review by DEQE and U.S. EPA.

Lakes and Ponds

Inventory

Number of lakes and ponds	162
Surface area of lakes and ponds (in acres)	6,224
Number of lakes and ponds greater than 10 acres	115
Surface area of lakes and ponds greater than 10 acres	5,948
Number of officially recognized Great Ponds	16
Surface area of officially recognized Great Ponds (in acres)	1,937

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
White Island Pond	Plymouth/Wareham	1976-1978	June 1980

Classification

Lake	Location	Stratification	Severity Points
Lake Noquochoke	North Dartmouth	S	13
Sassaquin Pond	Acushnet	S	5
Tinkham Pond	Acushnet/Mattapoisett	U	14
Turner Pond	Dartmouth	U	12
White Island Pond	Plymouth/Wareham	U	7

References

Massachusetts Division of Water Pollution Control. 1972. Buzzards Bay, Outer New Bedford Harbor Special Water Quality Study 1980. Westborough, Massachusetts. 45 pp.

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TABLE 5

BUZZARDS BAY BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Buttermilk Bay	*	SA	no	1975	--	--	--
Onset Bay	*	SA	no	1975	--	--	--
Wareham River	2.6-0.0	SA	no	1975	--	--	--
Weweantic River, downstream Horseshoe Pond	4.4-0.0	SA	no	1975	--	--	--
Sippican River, County Road to mouth	2.1-0.0	SA	no	1975	--	--	--
Sippican Harbor	*	SA	no	1975	--	--	--
Aucoot Cove	*	SA	no	1975	--	--	--
Mattapoisett Harbor	*	SA	no	1975	--	--	--
Westport River, West Branch	4.5-0.0	SA	no	1975	--	--	--
Outer New Bedford Harbor	*	SA	yes	1971 1975 1980	Periodic coliform PCB Dissolved oxygen	WWTP. Sediment.	Upgrade WWTP. Control PCB situation.
Clark Cove	*	SA	yes	1975	Periodic coliform	CSO.	CSO control.
Apponagansett Bay	*	SA	yes	1975	Periodic coliform	Undefined.	Determine current water quality; make appropriate abatement program.
Westport River, East Branch from County Road to mouth	10.0-0.0	SA	yes	1975	Periodic coliform	Undefined.	Determine current water quality; make appropriate abatement program.

TABLE 5 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Acushnet River from Main Street to Route 6	4.5-1.0	SB	yes	1971 1975 1980	Dissolved oxygen Coliform bacteria Heavy metals PCB	CSO. Sediment. Residuals.	Control of CSO. Control PCB in sediment.
New Bedford Inner Harbor	1.0-0.0	SB	yes	1971 1975 1980	Dissolved oxygen Coliform bacteria Heavy metals PCB	CSO. Sediment. Residuals.	Control of CSO. Control PCB in sediment.
Agawam River	10.6-0.0	B	no	1975	--	--	--
Wankinco River	4.5-0.0	B	no	1975	--	--	--
Weweantic River, above Horse-shoe Pond	12.2-4.4	B	no	1975	--	--	--
Sippican River, above County Road	6.8-2.1	B	no	1975	--	--	--
Mattapoisett River	9.5-0.0	B	no	1975	--	--	--
Achusnet River to Hamlin Road	8.2-5.5	B	no	1975	--	--	--
Paskamanset River	9.6-0.0	B	no	1975	--	--	--
Shingle Island River	5.2-0.0	B	no	1975	--	--	--
Acushnet River from Hamlin Road to Main Street	5.5-4.5	B	yes	1975	Dissolved oxygen Coliform bacteria	Dairy.	Correct runoff from farm.
Westport River, East Branch from outlet of Noquochoke Lake to Old County Road	12.0-10.0	B	yes	1975	Coliform bacteria	Undefined.	Determine current water quality; make appropriate abatement program.

* Represents estuary and/or harbor area; not defined by river miles

Total river miles assessed - 76.7
Total miles meeting standards - 69.2

CAPE COD DRAINAGE BASIN

Description of the Watershed

Cape Cod consists of 15 towns with a permanent 1980 population of 144,000. It's total area is 410 square miles of which 17 are covered by lakes and ponds. The Cape is devoid of any long rivers and streams. Herring River, six miles in length, is the longest river on Cape Cod.

Although there are only a few small freshwater streams, ponds and lakes are abundant on Cape Cod. Most ponds are relics from the last period of glaciation which ended approximately 15,000 years ago. The ponds are often the result of the depressions intersecting the groundwater table. The groundwater is naturally low in nutrients and is slightly acidic. The Massachusetts Division of Fisheries and Wildlife has, on occasion, added lime to some ponds to neutralize them and to increase the productivity of fisheries.

The Cape's soil is composed of unconsolidated glacial material such as sand, gravel and boulders deposited during the ice age. These deposits are found at various depths throughout the Cape, with a maximum depth of approximately 500 feet below sea level. Beaches were formed as a result of the melting ice releasing the debris (clay, silt, sand and boulders) it held and the action of the ocean.

Cape Cod is renowned for its beaches, swimming and other water based activities. Shellfishing, both recreational and commercial, is a large scale endeavor. Although the hard shell clams (Mercenaria mercenaria) are the main shellfish harvested chiefly from the Buzzards Bay area, some attempts to grow oysters on the south side of the Cape have also been made. Soft-shell clams and Bay-scallops are also important commercial species.

The groundwater system, which expresses itself at the surface in ponds, is the most important freshwater resource on the Cape. Groundwater is the water supply source for all drinking water on Cape Cod and is also the eventual receiving water for discharges from the few municipal and other treatment plants which now exist along with all of the individual home disposal systems.

Cape Cod is being considered for designation as a sole-source aquifer. This designation would mean that any federally funded project would be subjected to careful review before it was approved in order to protect groundwater quality.

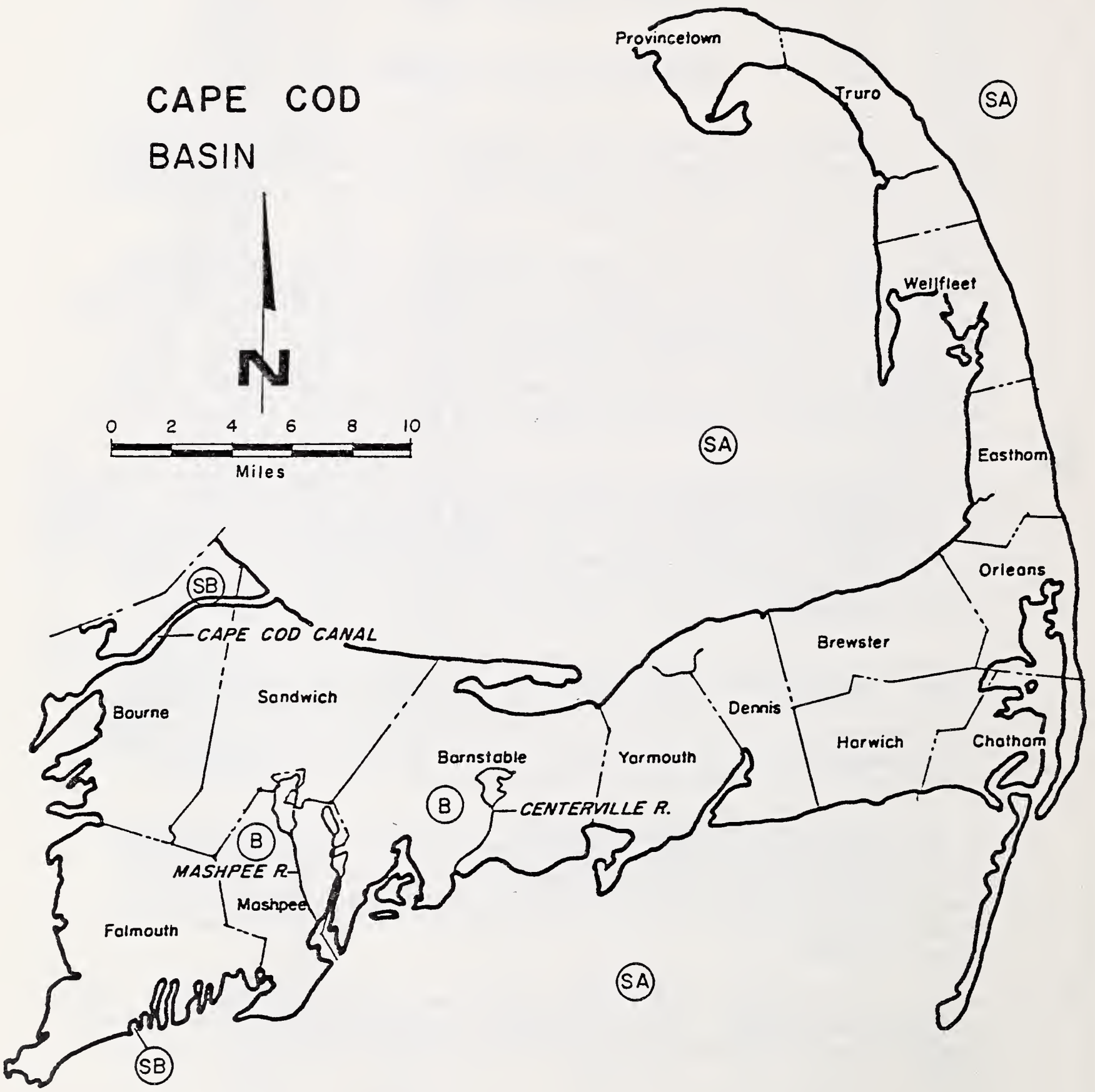
CAPE COD
BASIN
N
0 2 4 6 8 10
Miles
Provincetown
Truro
SA
Wellfleet
Eastham
Orleans
SB
CAPE COD CANAL
Brewster
Bourne
Sandwich
Dennis
Harwich
Chatham
Barnstable
Yarmouth
B
CENTERVILLE R.
B
MASHPEE R.
Mashpee
Falmouth
SA
SB

FIGURE 6

Water Quality Conditions and Trends

The majority of the coastal waters surrounding Cape Cod are of good quality although there are some water quality problem areas. Most water quality degradation is the result of septic system failures and intense use of motor boats in some bays and harbors. Water pollution problems have led to the closure of approximately three percent of the Cape's 12,600 acres of productive shellfish beds. These areas not meeting the strict standards for open shellfishing, however, are of sufficiently high quality to permit swimming. In general, small individual wastewater discharges account for high coliform bacteria counts in most of the closed shellfish areas.

The high quality of the coastal waters is apparently matched by that of the surface and groundwater. However, the fact that surface waters of Cape Cod consist of numerous small streams, inlets, estuaries, and ponds makes the assessment of the Cape's water quality conditions time consuming and labor intensive. In fact, water quality sampling by the MDWPC to date has been rather cursory in nature. It seems likely, however, that the major water quality problem in fresh surface waters and coastal embayments will be increased eutrophication resulting from nitrogen and phosphorus loadings from faulty septic systems in densely populated areas and fertilizer runoff from golf courses, parks, and isolated agricultural land. In addition, the already acidic conditions exhibited in many of the Cape's lakes and ponds could be further impacted by acid precipitation.

The importance of the Cape's groundwater resources has already been alluded to above. As the major source of drinking water, groundwater must be carefully protected. In various locations on Cape Cod, groundwater quality is threatened by the natural occurrence of iron and manganese or by saltwater intrusion. The latter has occurred in the North Truro-Provincetown area dating back to the 1930's. Future treatment may be necessary to remove iron and manganese from groundwater should their concentrations be high enough to hinder water use. Finally, elevated nitrates in groundwater resulting from overloaded or densely situated on-lot subsurface disposal systems, increased fertilizer use, and wastewater treatment plant discharges to the ground may threaten groundwater use as a drinking water supply in some areas. Wastewater treatment facilities with final effluent disposal to the ground are located in Hyannis, Chatham, Falmouth, Wellfleet, and at Otis and North Truro Air Force Bases.

A number of wastewater discharges to surface waters occur throughout Cape Cod. Most are small, isolated sewerage systems with little or no treatment. Woods Hole, a village within the town of Falmouth has a collection system which transports approximately 500,000 gallons of sewage per day to a small facility that provides comminution and chlorination prior to final discharge to Great Harbor. A facilities plan and environmental impact statement have been formulated for the town of Falmouth which recommend the construction of a new wastewater treatment facility at the town's new industrial park with effluent disposal to the ground. In addition, the Woods Hole system will be rehabilitated to reduce infiltration and inflow.

Facilities planning has been initiated in the towns of Bourne, Sandwich, Orleans, and Chatham to evaluate wastewater needs and make recommendations for upgrading existing sewerage systems and/or providing new facilities. As these plans are implemented in the future, many existing discharges will be eliminated or properly treated to lessen adverse impacts on receiving waters. In unsewered areas, rehabilitation of on-lot subsurface disposal systems will serve to reduce water quality problems associated with septic system failures.

The single largest point discharge on the Cape is that of the Canal-Montaup Electric Company's power plant at Sandwich. This is a cooling water discharge of 522 MGD that is released through diffusers to Cape Cod Canal. Discharge limitations are clearly outlined in the Canal Electric NPDES permit, and a thorough monitoring program is continually carried out to minimize impacts on Cape Cod Canal.

Lakes and Ponds

Inventory

Number of lakes and ponds	353
Surface area of lakes and ponds (acres)	11,711
Number of lakes and ponds greater than 10 acres	206
Surface area of lakes and ponds greater than 10 acres	10,922
Number of officially recognized Great Ponds	54
Surface area of officially recognized Great Ponds (acres)	6,073

Classification

Lake	Location	Stratification	Severity Points
Ashumet Pond	Mashpee	S	7
Baker Pond	Orleans	S	5
Cedar Pond	Falmouth	U	4
Clapps Pond	Provincetown	U	12
Cliff Pond	Brewster	S	7
Depot (Long) Pond	Eastham	S	2
Flax Pond	Bourne	U	5
Flax Pond	Dennis	S	1
Fresh Pond	Dennis	U	7
Goose Pond	Chatham	S	5

Classification (continued)

Lake	Location	Stratification	Severity Points
Great Herring Pond	Plymouth	S	9
Great Pond	Eastham	S	13
Gull Pond	Wellfleet	S	5
Herring Pond	Eastham	S	9
Hinckley Pond	Harwich	S	8
Hoxie Pond	Sandwich	S	11
John's Pond	Mashpee	S	10
Long Pond	Wellfleet	S	2
Mashpee/Wakeby Pond	Mashpee	S	9
Pilgrim Lake	Orleans	S	5
Queen Sewell Pond	Bourne	U	2
Salt Pond	Falmouth	S	12
Santuit Pond	Mashpee	U	11
Schoolhouse Pond	Chatham	S	2
Sheep Pond	Brewster	S	4
Shubael Pond	Barnstable	S	6
Snake Pond	Sandwich	U	3
The Reservoir	Harwich	U	9
Village Pond	Truro	U	11
Wequaquet Lake	Barnstable	U	5

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Cape Cod Planning and Economic Development Commission. 1978. Water Quality Management Plan/EIS for Cape Cod. Barnstable, Massachusetts. 2 Volumes.

Massachusetts Division of Water Pollution Control. 1976. Cape Cod Water Quality Management Plan. Westborough, Massachusetts. 61 pp.

_____. 1977. Cape Cod 1976 Water Quality & Wastewater Discharge Data. Westborough, Massachusetts. 133 pp.

TABLE 6

CAPE COD DRAINAGE BASIN

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Old Harbor and Scorton Creeks (Sandwich); Namskaket Creek and Nauset Harbor (Orleans); Herring River (Eastham); Pamet River (Truro); Chatham Harbor and Frostfish Creek (Chatham); Wychmere Harbor and Swan Pond River (Harwich); Lewis Bay (Yarmouth); Hyannis Harbor and Cotuit Bay (Barnstable); Poponesset Bay (Mashpee); Waquoit Bay, Eel, Bournes, Green, Great and Little ponds, Little Harbor, Great Harbor, Eel Pond in Woods Hole, Quisset Harbor, Sipperwisset, West Falmouth Harbor, Wild Harbor, and Herring Brook (Falmouth); Red Brook, Pocasett, and Phinney's Harbors (Bourne).	SA	no	1976	--	--	--
Mill Creek and Barnstable Harbor (Sandwich); Chase Garden Creek and Parkers River (Yarmouth); Sesuit and Quivett Creeks (Dennis); Little Namskaket Creek (Orleans); Red River and Herring River (Harwich); Lewis Bay and Centerville Harbor (Barnstable); Siders and Oyster Ponds (Falmouth).	SA	yes	1976	Coliform bacteria	Faulty septic systems.	Septic system rehabilitation. Facilities planning in Sandwich, Bourne, Orleans, and Chatham. Falmouth WWTP construction.

TABLE 6 (CONTINUED)

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Rock Harbor Creek and Boat Meadow River (Eastham); Wellfleet Harbor (Wellfleet); Provincetown Harbor; Stage Harbor (Chatham); Bass River (Yarmouth-Dennis); Salt Pond and Megansett Harbor (Falmouth).	SA	yes	1976	Coliform bacteria Dissolved oxygen Nutrients	Faulty septic systems. Urban runoff. Heavy boat use.	Septic system rehabilitation. Facilities planning in Chatham. Falmouth WWTP construction.
Dock Creek, Sandwich	SA	yes	1976	Coliform bacteria Dissolved oxygen Ammonia-nitrogen	Faulty septic systems. Urban runoff.	Septic systems rehabilitation. Facilities planning
Buck Creek, Chatham	SA	yes	1976	Coliform bacteria Dissolved oxygen	Faulty septic systems. Natural conditions.	Upgrade Chatham sewerage and treatment systems.
Cape Cod Canal (Sandwich); Cape Cod Canal (Bourne); Allens Harbor (Harwich); Falmouth Inner Harbor (Falmouth).	SB	no	1976	--	--	--

Number of segments assessed - 58
Number of segments meeting standards - 35

CHARLES RIVER BASIN

Description of the Watershed

The Charles River, the longest river in Massachusetts with a length of 80 miles, begins at a spring on the southerly slope of Honey Hill in the town of Hopkinton. From this humble beginning the river meanders its way through numerous communities in eastern Massachusetts and culminates by discharging into Boston Harbor at the outlet of the Charles River Basin. The initial flow of the river is southerly through the towns of Milford and Hopedale and then pursues a zig-zag route in a generally northeasterly direction through the communities of Bellingham, Medway, Millis, Norfolk, Medfield, Sherborn, Dover, Wellesley, Needham, Dedham, Newton, Waltham, Watertown, Cambridge and Boston. The river basin encompasses an area of 307 square miles and is somewhat hour-glassed in shape. The watershed is between five and 15 miles wide and approximately 31 miles in length. With a beginning elevation of 500 feet above mean sea level, the river ends at sea level in Boston Harbor.

An outstanding feature of the Charles River is its meandering nature through extensive wetlands which border the river through much of its course. These wetlands account for about 20,000 acres, approximately one tenth of the watershed area. This buffer zone acts as a significant area of wildlife propagation and as a natural hydraulic storage area which can help dampen peak flood flows.

The stream flow of the river is monitored by two USGS stream gages, one located in Millis with a drainage area of 85.9 square miles and the other located in Dover with a drainage area of 184 square miles. The average yearly flow at the gages are 162 and 303 cubic feet per second (cfs), respectfully. The extremes for low and high flows are 12 and 2,150 cfs for Millis and 0.9 and 3,220 cfs for Dover. In the town of Dedham, approximately one-third of the Charles River flow is diverted through the Mother Brook diversion to the Neponset River. The diversion was originally constructed for hydro-power but its current status has been relegated to flood control purposes. It has been proposed by the Division that the diversion be eliminated except in times when flood control is necessary. This program would allow the Charles River to maintain a higher streamflow would increase its assimilative capacity.

Several tributaries flow into the Charles River with the most important being: Mine Brook in Franklin; Chicken Brook in Holliston and Medway; Sugar Brook in Millis; Bogastow Brook in Holliston, Sherborn and Millis; and Stop River in Norfolk. These tributaries contribute flow to the mainstem Charles River, provide attenuation of flood flows and also receive wastewater discharges.

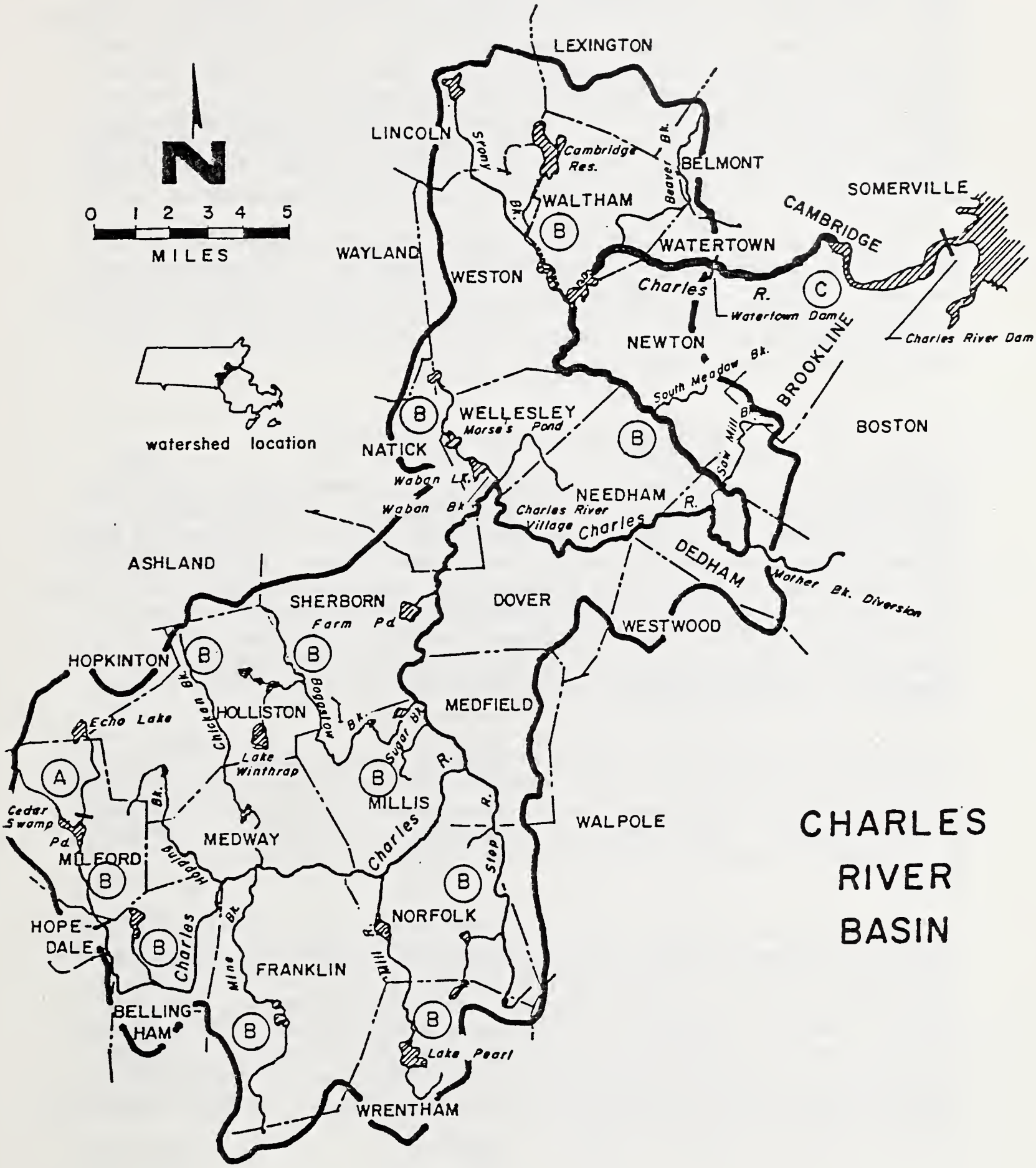
N
0 1 2 3 4 5
MILES
watershed location
LEXINGTON
LINCOLN
Sronly Bk.
Cambridge Res.
Beaver Bk.
BELMONT
WALTHAM
SOMERVILLE
CAMBRIDGE
WAYLAND
WESTON
WATERTOWN
Charles R.
Watertown Dam
Charles River Dam
NEWTON
BROOKLINE
South Meadow Bk.
Saw Mill Bk.
BOSTON
WELLESLEY
Morse's Pond
NATICK
Waban Lk.
Waban Bk.
NEEDHAM
Charles River Village
Charles R.
DEDHAM
Mother Bk. Diversion
ASHLAND
SHERBORN
Farm Pd
DOVER
WESTWOOD
HOPKINTON
Chicken Bk.
HOLLISTON
Boggy Low Bk.
Sugar Bk.
MEDFIELD
Echo Lake
Lake Winthrop
MILLIS
R.
Cedar Swamp Pd
Bk.
MILFORD
Hopping Bk.
MEDWAY
Charles R.
WALPOLE
Slop
NORFOLK
HOPE-DALE
Charles
Mine Bk.
FRANKLIN
Pill R.
BELLING-HAM
Lake Pearl
WRENTHAM
watershed location
CHARLES RIVER BASIN

FIGURE 7

The upper portion of the Charles River receives discharges from the Milford, Upper Charles and Medfield wastewater treatment facilities. The Milford facility is scheduled to be upgraded to advanced treatment by 1985, while the others are existing advanced treatment. The Millis WWTP which discharges to Sugar Brook is scheduled to connect to the Upper Charles WWTP and the Medfield State Hospital, which discharges to the Charles River is scheduled to connect to the Medfield WWTP. Pondville Hospital WWTP, Norfolk-Walpole MCI WWTP and the Wrentham State Hospital WWTP discharge to the Stop River. These facilities are currently being evaluated by the Division and upgradings will be instituted as necessary.

The middle and lower portions of the Charles River are serviced by the Metropolitan Sewerage District system which conveys its wastewater to the Deer Island and Nut Island WWTP's in Boston Harbor. Thus, there are no significant discharges to the Charles River in this portion of the river. The main impacts are from stormwater and urban runoff associated with a stream in an heavily developed area.

Water Quality Conditions and Trends

Significant water pollution abatement actions (as referenced above) and numerous industrial dischargers which have gone out of business have coupled together to vastly improve the water quality of the Charles River. The major problems remaining in the basin are: impacts from the Milford WWTP especially in the area of Box Pond; low dissolved oxygen levels in the Stop River which are caused by a combination of the discharge from the Norfolk-Walpole MCI WWTP and the natural oxygen demand exerted by the wetlands of the stream; moderate eutrophication caused by impounded waters which still receive adequate levels of nutrients; and stormwater which carries silt, oil and grease, and bacteria.

The problems caused by the direct discharges from the Milford WWTP and the Norfolk-Walpole MCI WWTP will be significantly reduced by future abatement actions at those facilities. Due to the hydraulics of the river and the minimal nutrient requirements for eutrophication, there will continue to be moderate levels of algal activity and eutrophication in the Charles River.

Stormwater inputs in the river can temporarily restrict its usage due to aesthetic problems and bacterial contamination. These problems which are time specific cannot, in reality, be eliminated but must be considered an inherent aspect of an urban stream. These two phenomenon will not, however, restrict the uses of the river as a significant water resource. The river can be utilized for passive recreation, warmwater fisheries, canoeing and wildlife propagation. The Charles River is truly a fine natural resource which should be capable of supporting its water use classification and its designated uses.

Lakes and Ponds

Inventory

Number of lakes and ponds	119
Surface area of lakes and ponds (in acres)	3,451
Number of lakes and ponds greater than 10 acres	58
Surface area of lake and ponds greater than 10 acres	3,155
Number of officially recognized Great Ponds	11
Surface area of officially recognized Great Ponds (in acres)	907

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Lake Pearl	Wrentham	1974-1975	March 1976
Lake Winthrop	Holliston	1978-1979	April 1980

Classification

Lake	Location	Stratification	Severity Points
Lake Archer	Wrentham	S	9
Box Pond	Bellingham	U	15
Echo Lake	Hopkinton	S	3
Farm Pond	Sherborn	S	2
Highland Lake	Norfolk	S	14
Houghton's Pond	Holliston	U	13
Mirror Lake	Wrentham	U	10
Morses Pond	Wellesley	U	6
Lake Pearl	Wrentham	S	9
Populatic Pond	Norfolk	U	11
Rosemary Lake	Needham	U	10
Silver Lake	Bellingham	U	7
Lake Waban	Wellesley	S	9
Lake Winthrop	Holliston	S	9

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TABLE 7

CHARLES RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Charles River from its headwaters in Hopkinton to Dilla Street, Milford	78.9-76.5	A	no	1973 1978 1980	--	--	--
Charles River from Dilla Street, Milford to Milford WWTP	76.5-73.4	B	yes	1973 1978 1980	Dissolved oxygen Coliform bacteria	Undefined urban runoff.	Control at Cedar Swamp Pond; runoff control.
Charles River from Milford WWTP to Beech Street, Bellingham	73.4-64.7	B	yes	1973 1978 1980 1981	Dissolved oxygen	Milford WWTP impoundments.	Upgrading of Milford WWTP control of eutrophication and sediment in impoundments.
Charles River from Beech Street, Bellingham to South Natick Dam, Natick	64.7-41.1	B	no	1973 1978 1980 1981	Diurnal dissolved oxygen	Algal, macrophyte activity.	Inherent condition, probably will continue.
Charles River from South Natick Dam to Watertown Dam	41.1-9.8	B	no	1973 1978	Diurnal dissolved oxygen	Algal, macrophyte activity.	Inherent condition, probably will continue.
Stop River from headwaters in Wrentham to Norfolk-Walpole MCI WWTP	8.8-4.1	B	no	1973 1978 1980	--	--	--
Stop River from Norfolk-Walpole MCI WWTP to confluence with the Charles River	4.1-0.0	B	yes	1973 1978 1980	Dissolved oxygen	Norfolk-Walpole MCI WWTP. Natural wetlands.	Evaluation and control of WWTP natural condition, low dissolved oxygen levels will continue.

Total miles assesed (Charles River) - 69.1
Total miles meeting standards (Charles River) - 57.3

Total miles assessed (Stop River) - 8.8
Total miles meeting standards (Stop River) - 4.7

CHICOPEE RIVER BASIN

Description of the Watershed

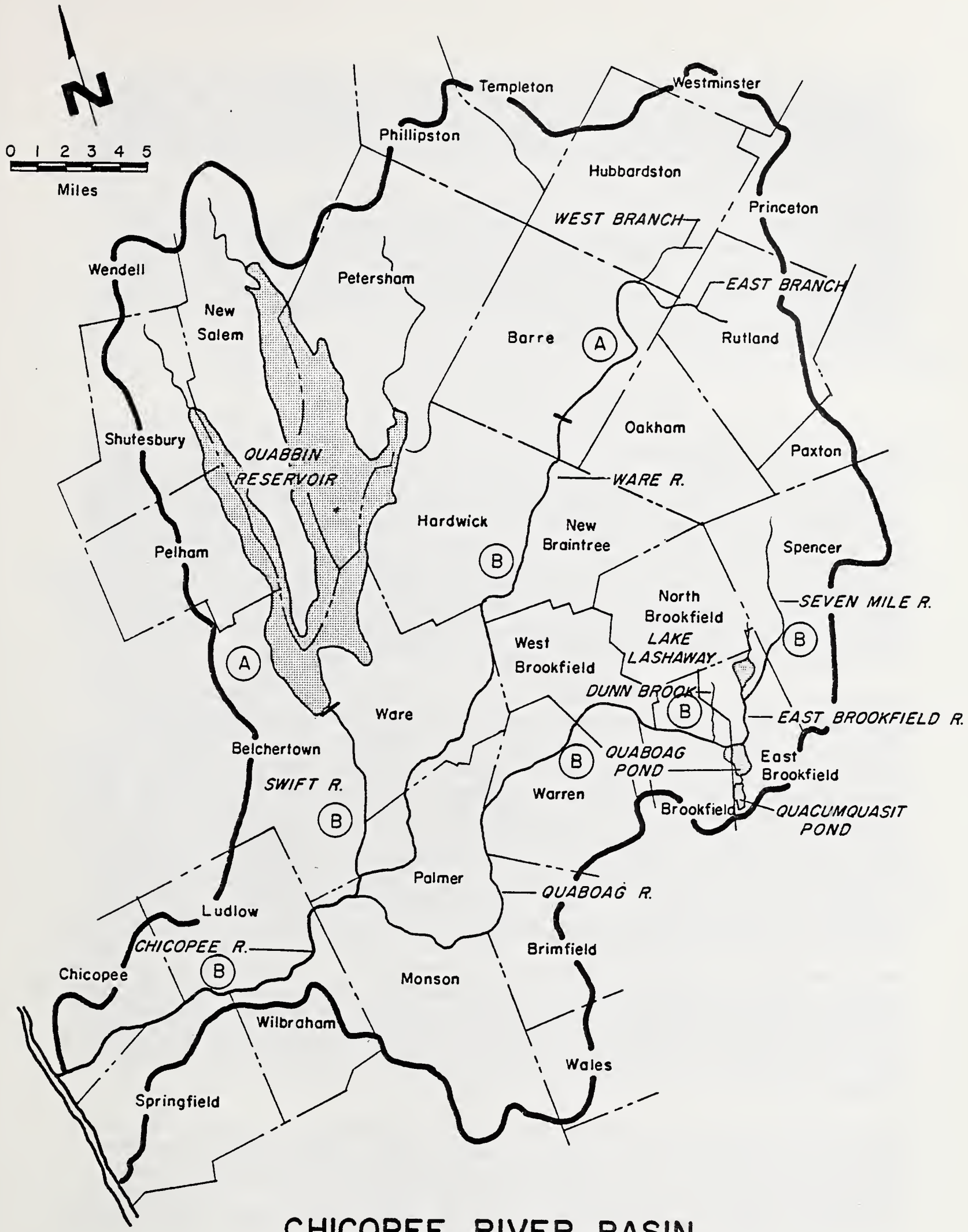
The Chicopee River Basin covers an area of over 720 square miles in central Massachusetts. All or part of 32 towns (1970 population 371,000) lie within the basin, with the majority of the population concentrated in the Springfield Metropolitan Area (1970 population 275,000). Generally the remaining area typifies the image of rural New England countryside with rolling hills, woodlands, small ponds, and winding brooks.

The basin includes four major adjoining river systems--the Ware River, the Swift River, the Quaboag River, and the Chicopee River--which together contribute an average flow of about 1,925 cubic feet per second (598 million gallons per day) to the Connecticut River.

The Ware River is formed by the confluence of the east and west branches in Barre. The west branch drains a swamp in Hubbardston while the east branch, which carries the greater flow, originates in Rutland. From their confluence the Ware River flows generally southwest for a distance of 34 miles, dropping in elevation some 380 feet and draining an area of 219 square miles. Classified A in its upper reaches, Ware River water is diverted by the Metropolitan District Commission to Quabbin Reservoir. Below the reservoir intake to just below Barre center the river is classified B and below this point as it begins to receive domestic sewage from Barre, Hardwick, and Ware; and industrial discharges from Barre, Ware, and Palmer. Also, three major impoundments impede its progress in Hardwick, Ware, and Palmer. The Ware river joins the Quaboag River at Three Rivers in Palmer.

The three upper branches of the Swift River flow into Quabbin Reservoir, a major component of the water supply of metropolitan Boston. This was formed by the construction of Winsor Dam which now controls the upper 186 square miles of drainage area of the Swift. Below Quabbin, the largest inland body of water in Massachusetts, the Swift River continues in a southerly direction for 10 miles until its confluence with the Ware River less than a mile above Three Rivers and drains an additional 30 square miles. Above Winsor Dam the Swift River is classified A and below the dam it is classified B.

The Quaboag River flows in a southwesterly direction for over 37 miles until it joins the Ware River at Three Rivers. Along this course the elevation drops some 650 feet. The river is known first from its source in Spencer as the Sevenmile River which joins the East Brookfield River which in turn enters Quaboag Pond. Emerging from Quaboag Pond in a flat swampy area, the Quaboag gathers flow and velocity encountering only one small impoundment in west Warren before it joins the Ware



CHICOPEE RIVER BASIN

FIGURE 8

River. The river drains 210 square miles and is classified B, except for a few reservoirs on its tributaries which are classified A. The Quaboag receives domestic discharges from Spencer and the Brookfields, as well as Warren and Palmer. Small industrial discharges are located in Brookfield, Warren, and Palmer.

The confluence of the Ware and Quaboag rivers forms the Chicopee River which continues 18 miles through the more heavily populated and industrialized portion of the basin and over a series of dams, some of which can regulate the flow. The Chicopee River is classified B and receives both domestic and industrial discharges along its course, until it joins the Connecticut River in Chicopee.

Water Quality Conditions and Trends

The Ware River, above the town of Ware, generally meets existing Class B water quality standards. The elimination of domestic waste discharges in the town of Barre will soon be completed, thus reducing coliform bacteria densities to levels in compliance with Class B criteria. The Ware River, below the town of Ware, remains polluted by industrial and domestic wastewater. The stream is subjected to high concentrations of nutrients that encourage eutrophication instream from the point of discharge to the Diamond International Impoundment. On the Swift River, completion of sewering in the village of Bondsville has reduced both the severity and occurrence of coliform bacteria violations of Class B standards.

The upper reaches of the Quaboag River, including the Sevenmile and East Brookfield rivers, are extremely sensitive to domestic wastewater discharges and agricultural runoff due to the streams' low assimilative capacities. Although existing discharges to the streams are highly treated, violations of Class B criteria are common. The Quaboag River, from West Brookfield to Monson, is swift-moving with an excellent assimilative capacity. No substantial violations of Class B criteria are known to occur in this river segment. However, as the Quaboag flows through the towns of Monson and Palmer, the river receives isolated, individual domestic discharges which prevent this river segment from meeting Class B coliform criteria. These discharges are scheduled for connection to existing Palmer-Monson sewage collection system. This same segment also receives treated metal and plating wastes, as does Chicopee Brook, a tributary to this river segment. The potential for toxic pollution due to the discharge of priority pollutants, such as selected heavy metals and trace organic compounds, by these industries is cause for concern. Fish kills attributed to industrial spills and ineffective treatment have occurred in this segment of the Quaboag River.

Since the completion of the Palmer-Monson Wastewater Treatment Plant in 1980, the Chicopee River, above the Ludlow Dam, meets Class B standards with the exception of coliform bacteria densities introduced to this segment at the confluence of the Ware and Quaboag rivers. Downstream of the Ludlow Dam to the confluence with the Connecticut River, the Chicopee

River receives treated municipal wastes from the Wilbraham Wastewater Treatment Plant. Although this plant receives extremely high-strength organic wastes which results in an effluent quality exceeding secondary treatment limits, the river is able to adequately assimilate this discharge under normal flow conditions. Major industrial discharges, most notably Monsanto Company, and several municipal discharges have been eliminated in the lower Chicopee River Basin. This was accomplished by the construction of interceptor sewers in 1978 in Chicopee and Springfield which now transport wastewater to the Springfield Regional Wastewater Treatment Facility at Bondi Island on the Connecticut River. Class B standards are generally met in this segment, but violations are common, particularly during storm events when combined sewer overflows carry domestic wastewater to the river in the urban Springfield area. These have a major impact on the water quality of the lower Chicopee River.

Priorities for abatement actions are determined and assigned based on the degree of impact the project will have on the water quality of the receiving waters. Most of the high priority projects identified in the original Chicopee River Basin Water Quality Management Plan (MDWPC, Westborough, 1976) have been accomplished. These projects focused on the larger and urban wastewater discharges in the lower basin. Several projects and studies identified as lower priority actions, but still very necessary to meet water quality goals, have been beset with delays due to economic and/or political considerations. Others have been proceeding through normal channels and are at various stages of completion as outlined in existing implementation schedules. These include pollution abatement projects in Barre, Ware, Warren, Spencer, and the Brookfields.

As the number of point sources of water pollution in the basin come under direct control, or are scheduled for abatement implementation, pollution control strategy will focus on the less obvious pollutant sources. These will include: combined sewer overflows, agricultural and stormwater runoff, and toxic pollutant monitoring. To adequately address these problems and to evaluate the completed abatement measures, the Division will continue its established water quality monitoring program which includes the sampling of streams, lakes, groundwater, and municipal, private, institutional, and industrial treatment facility effluents. This program may also be expanded to include bioassay studies for the identification and quantification of toxic substances.

The continuation of the Division's water quality monitoring program will insure that wastewater treatment facilities are operating efficiently and adequately to maintain the improved stream water quality (Class B) now characteristic of most of the Chicopee River Basin.

Lakes and Ponds

Inventory

Number of lakes and ponds	164
Surface area of lakes and ponds (in acres)	31,723
Number of lakes and ponds greater than 10 acres	102
Surface area of lakes and ponds greater than 10 acres	31,382
Number of officially recognized Great Ponds	15
Surface area of officially recognized Great Ponds (in acres)	1,294

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Lake Mattawa	Orange	1975-1976	May 1978
Quaboag Pond	Brookfield/ E. Brookfield	1974-1975	February 1976
Quacumquasit Pond	Brookfield/ E. Brookfield	1974-1975	February 1976
Queen Lake	Phillipston	1977-1978	May 1980
Red Bridge Impoundment	Ludlow/Wilbraham/ Palmer	1977-1978	June 1980

Classification

Lake	Location	Stratification	Severity Points
Beaver Lake	Ware	U	5
Bemis Pond	Hubbardston	U	10
Brigham Pond	Hubbardston	U	13
Camp Putnam Pond	New Braintree	U	4
Diamond International Impoundment	Palmer	U	11
Hardwick Pond	Hardwick	S	13
Harris Pond	Ludlow	U	11
Haviland Pond	Ludlow	S	7
Lake Lashaway	East Brookfield/ North Brookfield	S	8

Lake	Location	Stratification	Severity Points
Lake Mattawa	Orange	S	5
Minechoag Pond	Ludlow	U	9
Quaboag Pond	Brookfield/East Brookfield	U	8
Quacumquasit Pond	Brookfield/East Brookfield	U	4
Queen Lake	Phillipston	U	1
Red Bridge Impoundment	Ludlow/Wilbraham/ Palmer	S	15
Sugden Reservoir	Spencer	U	4
Wickaboag Pond	West Brookfield	U	7

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TABLE 8

CHICOPEE RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Chicopee River							
Source in Palmer to Wilbraham WWTP	17.9-11.7	B	yes	1972 1974 1980	Coliform bacteria	Urban and agricultural runoff.	Land management techniques, and sewer flushing.
Wilbraham WWTP to Chicopee Falls, Chicopee	11.7-3.0	B	no	1972 1974 1980	Occasional coliform bacteria	Urban runoff, carryover from upstream.	Combined sewer overflow elimination or treatment.
Chicopee Falls to confluence with Connecticut River Chicopee	3.0-0.0	B	yes	1972 1974 1980	Dissolved oxygen Coliform bacteria	Combined sewer overflows, urban runoff, carryover from upstream.	Combined sewer overflow elimination or treatment.
Ware River Basin							
East Branch Ware River from Rutland to Barre Falls Dam, Barre	4.8-0.0	A	no	1974	None	None	None
West Branch Ware River and Ware River above MDC intake, Barre	46.0-29.1	A	no	1972 1974 1980	None	None	None
MDC intake to South Barre	29.1-27.3	B	no	1972 1979 1980	None	None	None
South Barre to Wheelwright Dam, Hardwick-New Braintree	27.3-23.3	B	yes	1972 1979 1980	Coliform bacteria	Domestic discharges.	Secondary treatment facility currently under construction.
Wheelwright Dam to Ware Dam, Ware	23.3-12.2	B	no	1972 1974 1980	None	None	None

TABLE 8 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Ware River Basin (continued)							
Ware Dam to Thorndike Dam, Palmer	12.2-3.3	B	yes	1972 1974 1980 1981	Dissolved oxygen. Total and suspended solids, color, coliform bacteria	Untreated and inadequately treated industrial and domestic discharges.	Upgrading of the Ware WWTP to provide secondary treatment and phosphorus removal. Reduction of agricultural and stormwater runoff.
Thorndike Dam to confluence with Quaboag River, Palmer	3.3-0.0	B	no	1972 1974 1980	Occasional coliform bacteria	Isolated domestic discharges.	Tie-in to existing wastewater collection system.
Prince River	8.4-0.0	B	no	1978	None	None	None
Swift River above Windsor Dam	above 9.8	A	no	1974	None	None	None
Windsor Dam to Bondsville	9.8-4.4	B	yes	1974	Solids Nutrients	McLaughlin Fish Hatchery.	Solids removal from fish hatchery effluent.
Bondsville to confluence with Ware River in Palmer	4.4-0.0	B	no	1974 1980	Occasional coliform bacteria	Isolated domestic discharges.	None
Quaboag River Basin							
Sevenmile River from source to Smithville Road, Spencer	8.6-4.0	B	no	1974	None	Natural conditions.	None
Smithville Road to confluence with East Brookfield River, East Brookfield	4.0-0.0	B	yes	1972 1974 1977 1979	Dissolved oxygen Ammonia-N Phosphorus	Spencers WWTP. Natural conditioning.	Upgrade Spencer WWTP to provide nutrient removal. (NH_3-N, Phosphorus).
East Brookfield River, source to Quaboag Pond, East Brookfield	2.2-0.0	B	yes	1972 1974 1977 1979	Dissolved oxygen Ammonia-N Phosphorus	Spencer WWTP. Natural conditioning.	Upgrade Spencer WWTP to provide nutrient removal, (NH_3-N, Phosphorus.

TABLE 8 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Quaboag River Basin (continued)							
Quaboag River from Brookfield to Route 67 bridge, West Brookfield	24.9-19.2	B	yes	1972 1974 1977 1979	Dissolved oxygen	Natural conditions.	None
Route 67 bridge to Route 32 bridge, Palmer-Monson	19.2-5.1	B	no	1972 1974 1979 1980	Occasional coliform bacteria	Agricultural runoff.	None
Route 32 bridge to confluence with Ware River, Palmer	5.1-0.0	B	yes	1972 1974 1980	Coliform bacteria	Isolated domestic discharges, stormwater runoff.	Tie-in existing waste-water collection system.
Dunn Brook above North Brookfield WWTP	4.9-3.3	B	no	1977 1979	None	None	None
North Brookfield WWTP to confluence with Quaboag River, Brookfield	3.3-0.0	B	yes	1977 1979	Dissolved oxygen Ammonia-N Phosphorus Coliform bacteria.	North Brookfield WWTP.	Upgrade North Brookfield WWTP to secondary treatment or land application of effluent.
Chicopee Brook, source to confluence with Quaboag River, Monson	7.0-0.0	B	no	1972 1974 1980	None	None	None

Total miles assessed (Chicopee River) - 17.9
Total miles meeting standards (Chicopee River) - 8.7

Total miles assessed (Ware River) - 40.8
Total miles meeting standards (Ware River) - 37.9

Total miles assessed (tributaries) - 18.2
Total miles meeting standards (tributaries) - 12.8

Total miles assessed (Quaboag River) - 24.9
Total miles meeting standards (Quaboag River) - 14.1

Total miles assessed (tributaries) - 22.7
Total miles meeting standards (tributaries) - 13.2

CONNECTICUT RIVER BASIN

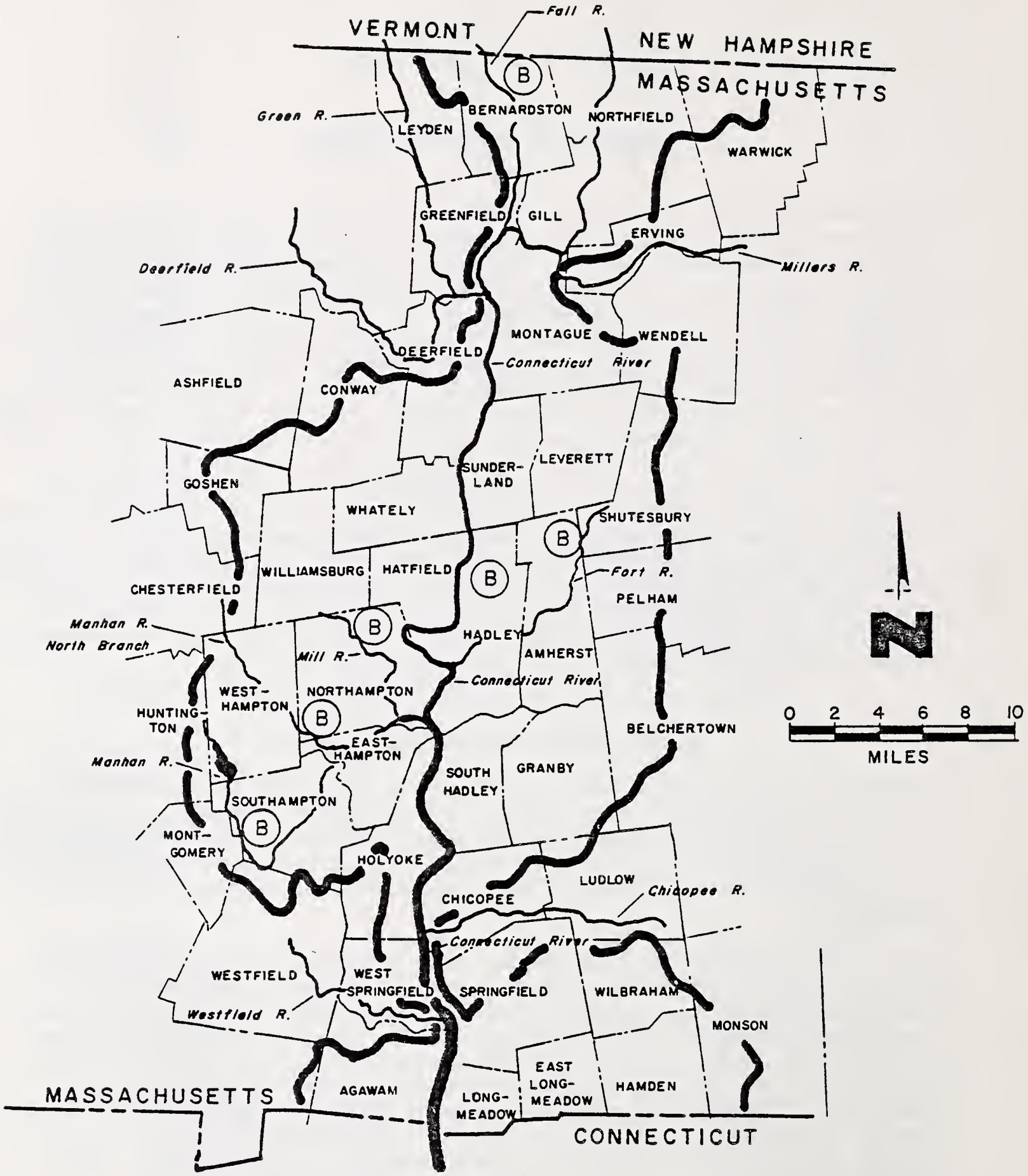
Description of the Watershed

The Connecticut River begins in Canada and for most of its course north of Massachusetts serves as the boundary between New Hampshire and Vermont. The river flows essentially due south through Massachusetts from Bernardston and Northfield on the Vermont-New Hampshire line to Agawam and Longmeadow on the Connecticut state line. From here the Connecticut flows south through the State of Connecticut to Long Island Sound. In Massachusetts the Connecticut River Basin is bounded by the Housatonic and Hoosic drainage basins on the west, and by the French and Quinebaug and the Nashua drainage basins on the east. There are approximately 66 river miles in Massachusetts. The Connecticut River main stem has a drainage area of 650 square miles in Massachusetts. This area had a 1970 population of 500,000 people. Most of these are located in the metropolitan Springfield area. The four major tributaries to the Connecticut River in Massachusetts are the Millers, Deerfield, Chicopee, and Westfield rivers. Each of these is dealt with separately in this report. When these four tributaries are added to the Connecticut River main stem, the drainage area in Massachusetts is 2,949 square miles and the population is more than 650,000 people. The Connecticut River is the largest river in New England. The average flow at the Massachusetts-Connecticut state line is 16,180 cfs.

Water Quality Conditions and Trends

The Connecticut River in Massachusetts is divided into two entirely different sections by the Holyoke Dam. Water quality surveys conducted on this river in 1971 and 1973 determined that the Lower Connecticut was severely degraded by a large number of untreated and partially treated wastewater discharges. Pollution above the Holyoke Dam was significant but not as severe as below the dam.

Since 1973, significant progress has been made towards eliminating water pollution in the Connecticut River Basin. Secondary treatment plants have been completed in Springfield, South Hadley, Holyoke, Northampton, Amherst, Sunderland, Montague, and Northfield. In addition to treating municipal wastes, many of these also treat significant amounts of industrial waste. Examples of this include the Monsanto Chemical Company wastes treated at the Bondi Island Regional Wastewater Treatment Facility, and numerous industrial wastes in Holyoke receiving treatment at the Holyoke Wastewater Treatment Plant. Although these new plants have some operations problems, they all generally produce an effluent which meets the limitations contained in their NPDES permits.



CONNECTICUT RIVER BASIN

FIGURE 9

The result of this major construction program is a significant improvement in the water quality of the Connecticut River Basin. Dissolved oxygen levels have increased to the point where violations are rare instead of routine. Coliform levels have improved markedly. The upper Connecticut River meets Class B standards now. The lower Connecticut River meets Class B standards except for coliform levels. Boating, fishing, and other water-based recreation have shown a steady increase since 1975. Shad runs are much larger now, and even salmon have returned in small numbers as a result of the Connecticut River Salmon Restoration Project. The outlook for the future is for further steady improvement in the water quality of the Connecticut River, and for further significant increases in the recreational uses of the river.

The largest remaining source of water pollution in the basin is coliform violations caused by combined sewer overflows from major cities in the lower part of the basin. With all major point sources now receiving treatment, surveys will be conducted in the summer of 1983 to attempt to determine the extent of this problem. A major program involving consultants sampling CSO's and Division personnel doing additional CSO related work on the river is tentatively scheduled for 1983 if funding can be obtained for the consultants' portion of the work.

An intensive water quality survey will be carried out in the Connecticut Basin during the summer of 1983. This will document progress to date and will locate any areas where Class B standards are being violated. In addition to the above noted surveys, compliance monitoring surveys will be routinely conducted in the Connecticut Basin. A program to check treatment plant effluents for toxic chemicals by using bioassay techniques is in the planning stages.

Water quality in the Connecticut River Basin has shown a remarkable improvement in the past few years. Major treatment plant construction is essentially completed. Control of CSO problems and elimination of operating problems at existing wastewater treatment plants are the areas where future efforts by the Division will be directed. The Connecticut River was seriously degraded only ten years ago and was not suitable for most recreational uses below the Holyoke Dam. Today, the entire river is a valuable recreational resource.

Lakes and Ponds*

Inventory

Number of lakes and ponds	97
Surface area of lakes and ponds (acres)	2,618
Number of lakes and ponds greater than 10 acres	47
Surface area of lakes and ponds greater than 10 acres	2,385
Number of officially recognized Great Ponds	3
Surface area of officially recognized Great Ponds (acres)	232

* No intensive surveys have been undertaken by the Division's Lake Section in the Connecticut River Basin.

Classification

Lake	Location	Stratification	Severity Points
Aldrich Lake	Granby	S	12
Arcadia Lake	Belchertown	U	6
Dimmock Pond	Sprigfield	U	8
Five Mile Pond	Springfield	S	6
Forge Pond	Granby	U	12
Holland Lake	Belchertown	S	8
Leverett Pond	Leverett	U	6
Long Pond	Springfield	U	8
Loon Pond	Springfield	U	6
Lake Lorraine	Springfield	S	7
Lower Highland Lake	Goshen	U	4
Lower Mill Pond	Easthampton	U	10
Metacomet Lake	Belchertown	U	7
Mona Lake	Springfield	U	13
Nashawannuck Pond	Easthampton	S	11
Nine Mile Pond	Wilbraham	S	10
The Oxbow	Northhampton	U	16
Porter Lake	Springfield	U	15
Rubber Thread Pond	Easthampton	U	11
Upper Highland Lake	Goshen	U	4
Van Horn Pond	Springfield	S	13
Venture Pond	Springfield	U	15
Warner's Pond	Hadley	U	12
Watershops Pond	Springfield	S	10
Lake Wyola	Shutesbury	S	9

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TABLE 9

CONNECTICUT RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Connecticut River from Vt.-N.H. line to Holyoke Dam, Holyoke-South Hadley	138.2-86.6	B	no	1978	Occasional coliform	CSO's, some untreated discharges.	--
Connecticut River from Holyoke Dam to Conn. line	86.6-70.7	B	yes	1978 1980	Coliform bacteria Nutrients	CSO's.	Control CSO's.
Bachelor Brook from the outlet of Forge Pond in Granby to the Connecticut River, South Hadley	9.1-0.0	B	no	1978 1980	--	--	--
Forge Pond, Weston Brook, Lampson Brook, Belchertown-Granby	12.4-9.1	B	yes	1978 1980	Nutrients, Dissolved oxygen	Belchertown STP discharge.	I/A treatment for the Belchertown discharge.

Total miles assessed (Connecticut River) - 67.5
Total miles meeting standards (Connecticut River) - 51.6

Total miles assessed (tributaries) - 12.4
Total miles meeting standards (tributaries) - 9.1

DEERFIELD RIVER BASIN

Description of the Watershed

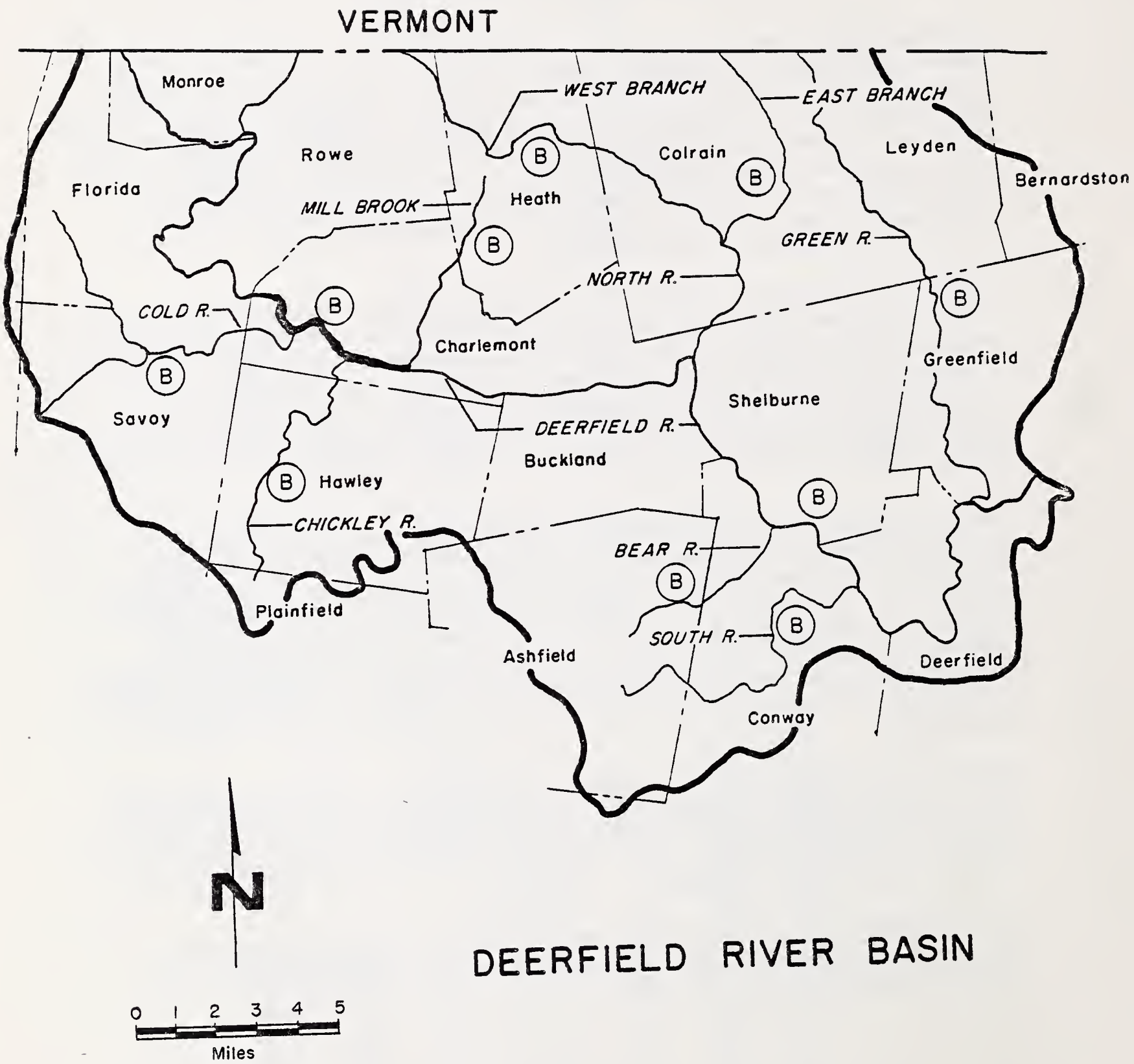
The Deerfield River represents a classic example of a formerly "wild river" which has been tamed by man. For most of its course in Massachusetts the Deerfield once ran through deep valleys on a steep gradient. The gradient was less and the velocity slowed down some in the last few miles as the Deerfield flowed across the flood plain of the Connecticut River, but even here the Deerfield still was shallow and flowed rapidly to its confluence with the Connecticut River. Now the flow of the Deerfield is continually interrupted by power dams located along its course in Massachusetts and Vermont.

In past years salmon spawned in the Deerfield's headwaters and numerous trout and other game fish lived in its inaccessible waters. The salmon are long since gone, due to the dams on the Connecticut River. Most of the trout are stocked each year, as over-fishing has severely depleted the natural trout population present in the river. The cougars are gone from the hills around the river and only a few of the once numerous bears remain. These, too, are on the brink of extinction in Massachusetts.

The headwaters of the Deerfield are in Vermont. After flowing through a series of reservoirs constructed by the electric utility companies, the Deerfield first enters Massachusetts as the discharge from Sherman Reservoir. For most of its length in Massachusetts, the river is alternately impounded behind electric utility dams, or flows on a steep gradient through sparsely populated valleys until it reaches the next downstream impoundment. After flowing for 44 miles through Massachusetts, the Deerfield joins the Connecticut River at the Greenfield-Deerfield town line.

Major tributaries to the Deerfield in Massachusetts are the North River and the Green River. These join the Deerfield in Shelburne Falls and Greenfield, respectively. Several of the tributaries to the Deerfield are either presently in use as water supplies or are being considered for future use as water supplies.

The population of the Deerfield Basin in Massachusetts was 32,753 in 1970. The average flow in the Deerfield at its confluence with the Connecticut River is 1,280 cfs.



DEERFIELD RIVER BASIN

FIGURE 10

Water Quality Conditions and Trends

The major sources of pollution to the Deerfield are the heated discharge from the Yankee Atomic Plant at Rowe, the discharge from the Deerfield Specialty Products Wastewater Treatment Plant in Monroe Bridge, the treated discharge from Kendall Fiber Products in Colrain, treated domestic sewage discharges from the Old Deerfield, Greenfield and Buckland/ Shelburne Sewage Treatment Plants, and untreated domestic sewage discharges from Charlemont and Ashfield.

A recently released report on the Yankee Atomic discharge and the Bear Swamp Pumped Storage Project concludes that these do not have a significant deleterious effect on the river. This report is the result of several years of study by the Massachusetts Division of Fisheries and Wildlife and the New England Power Company and was released jointly by these two parties.

Engineering reports are currently being prepared for the towns of Charlemont and Ashfield. These reports will recommend measures for alleviating the pollution caused by the untreated domestic sewage discharges in these towns. The only remaining significant problems in the Deerfield Basin are in the town of Greenfield. Combined sewer discharges in this town are currently being located and eliminated as part of an ongoing town project. The other problem in Greenfield is the town wastewater treatment plant. This plant consistently discharges a highly treated secondary effluent. Unfortunately, this is discharged to the Green River which has only minimal flows in the summer. In order to meet Class B standards in the Green River, a higher degree of treatment will be required than is possible in a secondary plant. The most economical solution to this may be to pipe the Greenfield discharge to the nearby Deerfield River where secondary treatment will be adequate.

All significant sources of pollution in the Deerfield Basin are currently receiving secondary treatment. It is expected that the remaining pollution problems in Charlemont, Ashfield, and Greenfield will be eliminated in the next few years as part of ongoing pollution abatement programs.

Lakes and Ponds*

Number of lakes and ponds	23
Surface area of lakes and ponds (acres)	859
Number of lakes and ponds greater than 10 acres	16
Surface area of lakes and ponds greater than 10 acres	832
Number of officially recognized Great Ponds	2
Surface area of officially recognized Great Ponds (acres)	42

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Deerfield River Basin.

Classification

Lake	Location	Stratification	Severity Points
Ashfield Pond	Ashfield	S	4
Pelham Lake	Rowe	U	10
Plainfield Pond	Plainfield	U	3
Sherman Reservoir	Monroe/Rowe/Whitingham, Vt.	S	4

References

Massachusetts Division of Water Pollution Control. 1975 Deerfield River Basin Water Quality Management Plan. Westborough, Massachusetts. 67 pp.

_____. 1977. Deerfield River 1977 Water Quality Data. Westborough, Massachusetts. 105 pp.

_____. 1978. Deerfield River Basin 1978 Wastewater Discharge Data. Westborough, Massachusetts. 16 pp.

_____. 1979. Deerfield River Basin 1977 Water Quality Analysis. Westborough, Massachusetts. 88 pp.

TABLE 10

DEERFIELD RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Deerfield River							
Vermont Line to Cold River, Charlemont	42.4-29.6	B	no	1977	--	--	--
Cold River to Dam 4, Charlemont	29.6-19.7	B	yes	1977	Coliform bacteria	Untreated discharges in Charlemont.	Construction of a treatment system for the center of Charlemont.
Dam 4, Charlemont to Connecticut River, Greenfield-Deerfield	19.7-0.0	B	no	1977	--	--	--
North River							
Vermont line to Deerfield River, Charlemont-Shelburne	9.5-0.0	B	no	1977	--	--	--
Green River							
Vermont line to Greenfield STP	14.0-0.5	B	no	1977	--	--	--
Greenfield STP to Deerfield River, Greenfield	0.5-0.0	B	yes	1977	Nutrients Chlorine Residual Solids	Greenfield STP.	Pipe Greenfield STP directly to Deerfield River.
South River							
Outlet Ashfield Pond to Emmets Road, Ashfield	13.3-11.4	B	yes	1977	Coliform bacteria Nutrients	Untreated discharges from the town of Ashfield.	Treatment must be provided for Ashfield Center discharges.
Emmets Road, Ashfield to Deerfield River, Conway	11.4-0.0	B	no	1977	--	--	--

Total miles assessed (Deerfield River) - 42.4
Total miles meeting standards (Deerfield River) - 32.5

Total miles assessed (tributaries) - 36.8
Total miles meeting standards (tributaries) - 34.4

FARMINGTON RIVER BASIN

Description of the Watershed

The Farmington River Basin covers a total area of 602 square miles. Approximately 149 square miles of this area are in southwestern Massachusetts. The Farmington River is a tributary of the Connecticut River; the confluence is located near Hartford in Windsor, Connecticut.

The major portion of this area in Massachusetts drains into the West Branch of the Farmington River and its tributaries. The remaining portion drains into Pond and Valley brooks, which form the East Branch of the Farmington River just below the state line in Connecticut. Throughout the entire basin, the terrain is hilly with large, relatively level areas occurring on the hilltops at about 1,200 feet above mean sea level. There are also numerous small mountain streams.

The headwaters of the Clam River are formed by many small streams located in uninhabited mountain wilderness. The Clam River is joined by the Buck River about two miles above its confluence with the West Branch of the Farmington River. The river is very rapid and has an average fall of about 100 feet per mile.

A large part of the headwaters of the Fall River are formed by Big Pond and Otis Reservoir. Flow in the river is regulated by Otis Reservoir, which is used for water storage and recreation. Because of Otis Reservoir and Big Pond, this portion of the basin contains a large seasonal population.

Water Quality Conditions and Trends

There are no known water quality problems in the Farmington River Basin; this situation is expected to continue.

Lakes and Ponds*

Inventory

Number of lakes and ponds	47
Surface area of lakes and ponds (acres)	3,531
Number of lakes and ponds greater than 10 acres	33
Surface area of lakes and ponds greater than 10 acres	3,450
Number of officially recognized Great Ponds	2
Surface area of officially recognized Great Ponds (acres)	395

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Farmington River Basin.

FARMINGTON RIVER BASIN

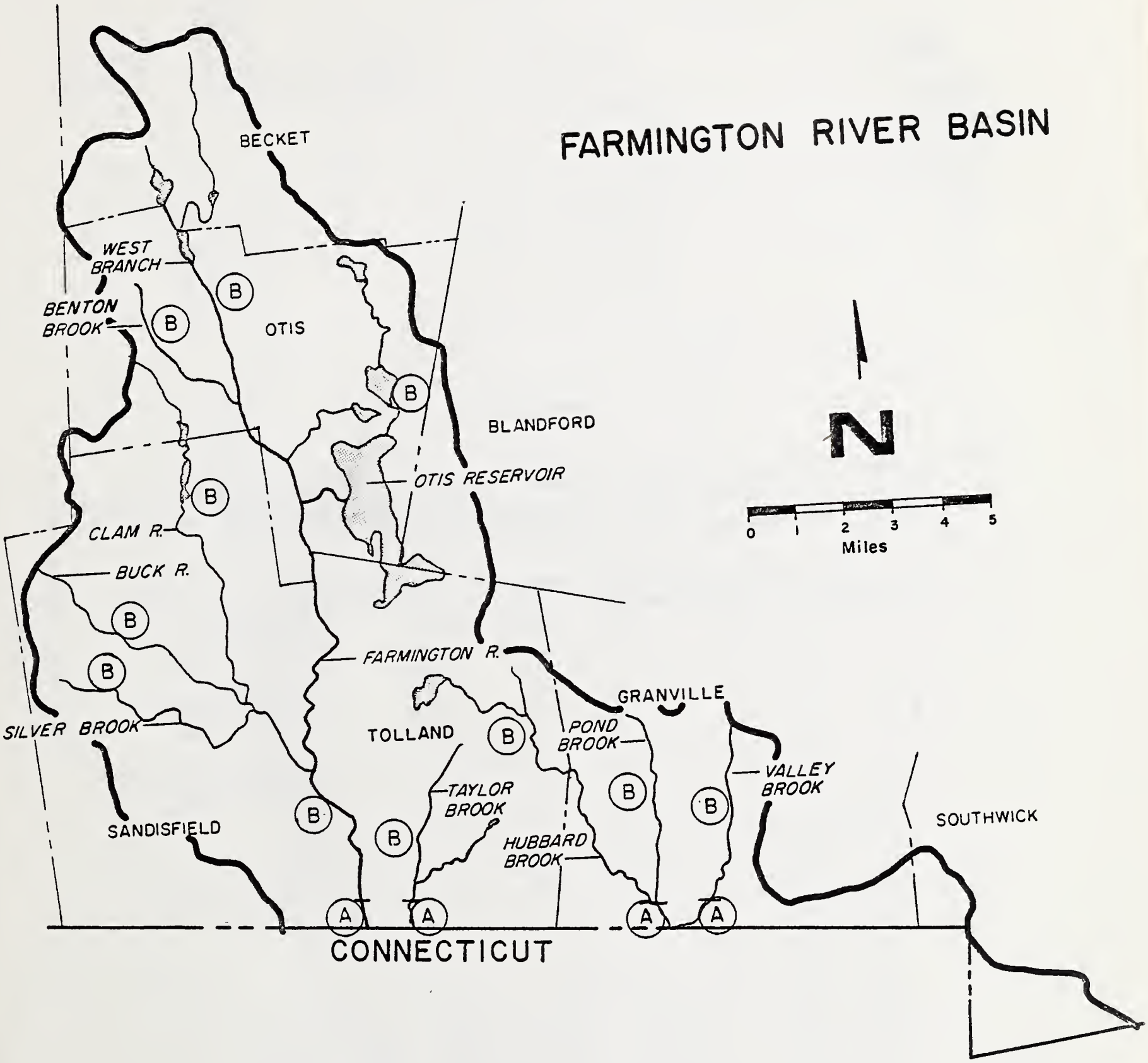


FIGURE 11

Classification

Lake	Location	Stratification	Severity Points
Benton	Otis	U	2
Big Pond	Otis	S	10
Cranberry Pond	Otis	S	11
Noyes Pond	Tolland	U	3
Otis Reservoir	Otis	S	5
Shaw Pond	Becket/Otis	S	5

References

Massachusetts Division of Water Pollution Control. 1975a. The Farmington River: 1974 water quality analysis and water quality management plan. Westborough, Massachusetts. 112 pp.

_____. 1975b. The Farmington River: 1974 water quality survey data. Westborough, Massachusetts. 45 pp.

TABLE 11

FARMINGTON RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
West Branch from Becket to 1,000 feet from Connecticut state line, Sandisfield-Tolland	14.6-0.2	B	no	1974	--	--	--
West Branch 1,000 feet from state line to state line, Sandisfield-Tolland	0.2-0.0	A	unknown	None	--	--	--
Fall River from source to confluence with West Branch, Otis	1.0-0.0	B	no	1974	--	--	--
Clam River from source in Otis to confluence with West Branch, Sandisfield	10.0-0.0	B	no	1974	--	--	--

Total miles assessed (Farmington River) - 14.4
Total miles meeting standards (Farmington River) - 14.4

Total miles assessed (tributaries) - 11.0
Total miles meeting standards (tributaries) - 11.0

FRENCH AND QUINEBAUG RIVER BASIN

Description of the Watershed

The French and Quinebaug River Basin is located in south-central Massachusetts and drains all or portions of the Massachusetts towns of Auburn, Brimfield, Brookfield, Charlton, Douglas, Dudley, Holland, Leicester, Oxford, Spencer, Southbridge, Sturbridge, Sutton, Wales, Warren, and Webster. In Massachusetts the French and Quinebaug River Basin drains an area of 241 square miles and had a population of approximately 74,000 in 1980.

The Quinebaug River begins in Union, Connecticut and flows northwest to Hamilton Reservoir, which lies on the Connecticut-Massachusetts state line. Leaving the reservoir the river then flows north through Holland and Brimfield in Massachusetts and turns east to Sturbridge, where it passes through Old Sturbridge Village. Upon leaving Sturbridge, the river turns southeast to Southbridge, where it is joined by Cady Brook, and on through Dudley to recross the state line at Thompson, Connecticut. The Quinebaug River is then joined by the French River in Thompson and continues south to Norwich where it is joined by the Shetucket River; this confluence forms the Thames River, which continues south to Long Island Sound at New London, Connecticut. Of the Quinebaug rivers 76 miles, 28 lie in Massachusetts and drain an area of 148 square miles. Municipal wastewater treatment plants in Sturbridge and Southbridge contribute to the flow in the Quinebaug River along with industrial discharges from the American Optical Company in Southbridge. Additional treated effluent is discharged to Cady Brook in Charlton by the towns' wastewater treatment facility.

The French River is a major tributary of the Quinebaug River and extends 26 miles from its source in Greenville Pond, Leicester, to the confluence with the Quinebaug River in Thompson, Connecticut. From its headwaters at Sargent Pond, Leicester (this portion is known as Town Meadow Brook and extends from Sargent Pond to Greenville Pond) the French River flows generally south throughout its length through Oxford, Dudley, and Webster to Thompson, Connecticut. Probably the best known feature along the French River is Lake Chargoggagoggmanchaugagoggchaubunagungamaugg (also known as Webster Lake) which not only has the longest name but is also one of the largest natural lakes in the state. The lake then drains to the French River via Mill Brook in Webster. Other tributaries discharging to the French River are generally small and include Burncoat, Bartons and Grindstone brooks in Leicester; the Little River in Oxford;Potash Brook in Webster; and Backwater and Sunset Hill brooks in Thompson. The Leicester, Oxford-Rochdale, Dudley, and Webster wastewater treatment plants discharge their effluents to the French River along with industrial discharges from Worcester Tool & Stamping in Leicester and non-contact cooling water from the Gordon Chemical Company.

FRENCH and QUINEBAUG RIVER BASINS

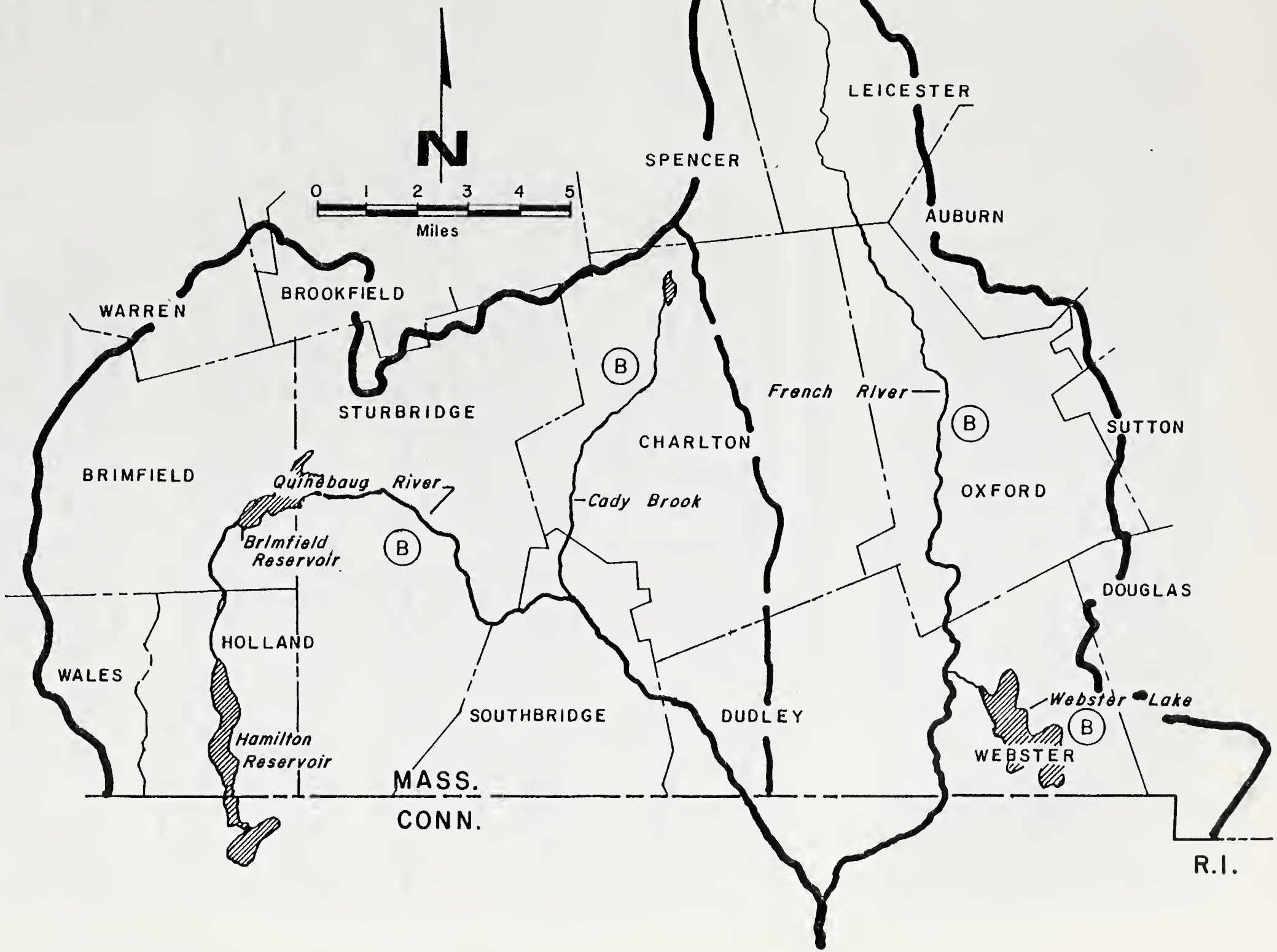


FIGURE 12

Four major flood control dams were constructed in Massachusetts by the U.S. Army Corps of Engineers (U.S.A.C.E) following extensive flooding in 1955. These are the Hodges Village Dam on the French River; the Buffumville Dam on the Little River, a tributary to the French River; and the East Brimfield and Westville dams on the Quinebaug River. The United States Geological Survey (U.S.G.S.) maintains six flow gaging stations in Massachusetts within the French and Quinebaug River Basin. The U.S.G.S. gage located in Webster on the French River (gage number 01125000) drains an area of 85.3 square miles and had an average flow of 159.0 cubic feet per second (cfs) from 1950 to 1980. The gaging station located on the Quinebaug River just over the state line in Quinebaug, Connecticut (Number 01124000) drains 156.0 square miles and had an average discharge of 270 cfs for the period from 1931 to 1980.

Water Quality Conditions and Trends

As early as the 1800's the French and Quinebaug Rivers have been subjected to high loadings of oxygen-demanding and nutrient-laden pollutants. A large number of mills and factories sprang up in areas adjacent to the rivers in Charlton, Dudley, Southbridge, Sturbridge, and Webster. Today, these towns remain industrialized with a wide diversification of products, including dairy products processing, electronics, tool and die shops, shoe industries, and cotton and rayon cloth printing and dyeing.

By the late 1960's these industries and domestic wastewater discharges had contributed to poor water quality in both the French and Quinebaug Rivers. As a result, a program was initiated to alleviate water quality problems. The Federal Water Pollution Control Act (PL92-500) of 1972 provided funding for the construction of municipal wastewater treatment facilities and the elimination of direct discharges of untreated sewage or industrial wastes. Today municipal treatment facilities are operating in Sturbridge, Charlton, and Southbridge on the Quinebaug River and Leicester, Oxford-Rochdale, Webster and Dudley on the French River.

Water quality problems do still exist in both rivers. Nitrogen and phosphorus concentrations are still responsible for algal blooms and characteristic diurnal fluctuations in Dutton Pond and the West Dudley Impoundment which are downstream from the Leicester WWTP and Southbridge WWTP, respectively. In addition, industrial wastes combined with domestic wastewaters in the towns of Charlton, Dudley, Southbridge, and Webster have kept segments of Cady Brook, the Quinebaug River and the French River from meeting their assigned B classification.

Water quality improvement over the past several years is demonstrated in both rivers due to changes in industrial discharges. Segments in Webster, West Dudley, Rochdale, and Charlton improved because discharges at Anglo Fabrics, Cranston Print Works, Webster Lens Company, Boise Cascade, Inc., Carleton Woolen and Charlton Woolen Company were discontinued. Upgrading the facilities at Charlton, Southbridge, Leicester and a regional facility at Webster to advanced secondary treatment with provisions for low flow augmentation in the French River should insure compliance with the Massachusetts Water Quality Standards for 64 of 70 river miles.

Lakes and Ponds

Inventory

Number of lakes and ponds	121
Surface area of lakes and ponds (acres)	5,989
Number of lakes and ponds greater than 10 acres	69
Surface area of lakes and ponds greater than 10 acres	5,713
Number of officially recognized Great Ponds	8
Surface area of officially recognized Great Ponds (in acres)	781

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Cedar Pond	Sturbridge	1980-1981	*
Webster Lake	Webster	1975-1976	November, 1980

Classification

Lake	Location	Stratification	Severity Points
Big Alum Lake	Sturbridge	S	8
Buffumville Reservoir	Charlton/Oxford	S	8
Cedar Pond	Sturbridge	U	8
East Brimfield Reservoir	Brimfield/Sturbridge	U	7
Lake George	Wales	S	8
Glen Echo Lake	Charlton	S	10
Greenville Pond	Leicester	S	10
Gore Pond	Charlton/Dudley	S	7
Granite Reservoir	Charlton	U	4
Hayden Pond	Dudley	S	1
Holland Reservoir	Holland	S	5
Leadmine Pond	Sturbridge	S	2
Little Alum Pond	Brimfield	S	3
Merino Pond	Dudley	U	2
Pierpoint Meadow Pond	Charlton/Dudley	U	4

* Report in progress

Classification (continued)

Lake	Location	Stratification	Severity Points
Robinson Pond	Oxford	U	4
Sherman Pond	Brimfield	U	7
Slater's Pond	Oxford	S	4
Stiles Reservoir	Leicester/Spencer	S	5
Texas Pond	Oxford	U	9
Walker Pond	Sturbridge	U	5
Webster Lake	Webster	S	6

References

Central Massachusetts Regional Planning Commission. 1980. Areawide Water Quality Management Plan. Worcester, Massachusetts.

Massachusetts Division of Water Pollution Control. 1975. French and Quinebaug River Basin Water Quality Management Plan. Westborough, Massachusetts. 84 pp.

_____. 1977. French and Quinebaug Rivers 1976 Water Quality Survey Data. Westborough, Massachusetts. 127 pp.

_____. 1980. The Quinebaug River 1980 Water Quality Survey Data. Westborough, Massachusetts. 63 pp.

_____. 1982. The French and Quinebaug River Basin, 1981 Water Quality Management Plan. Westborough, Massachusetts. (Unpublished).

Smith, Jeffrey B. 1978. French and Quinebaug Rivers 1974 & 1976 Water Quality Analysis. Massachusetts Division of Water Pollution Control, Westborough, Massachusetts 94 pp.

TABLE 12

FRENCH AND QUINEBAUG RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
French River above Leicester WWTP, Leicester	27.7-27.3	B	no	1972 1974 1976	--	--	--
Leicester WWTP, Leicester to Massachusetts Turnpike, Oxford	27.3-22.2	B	yes	1972 1974 1976	Dissolved oxygen Coliform bacteria Excessive algae Solids Phosphorus	Leicester WWTP.	Advanced secondary treatment at the Leicester Center Water Supply District.
Massachusetts Turnpike, Oxford to the Webster and Dudley WWTPs	22.2-8.0	B	yes	1976	Coliform bacteria Solids Phosphorus	Oxford-Rochdale WWTP & urban runoff.	Excessive infiltration and inflow at the Oxford-Rochdale WWTP should be eliminated to prevent hydraulic overloading.
Webster and Dudley WWTP's to Massachusetts-Connecticut state line	8.0-7.0	B	yes	1972 1974 1976	Dissolved oxygen Coliform bacteria Solids Phosphorus	Webster WWTP. Dudley WWTP. Urban runoff. Sediment.	Regional advanced secondary treatment facility in Webster. Low flow augmentation. Removal or inactivation of oxygen demanding sludge deposits in downstream impoundments.
Burncoat Brook, Leicester and Barton Brook, Leicester	1.2-0.0 1.2-0.0	B	no	1976	Dissolved oxygen pH Solids	Wetlands.	--

TABLE 12 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Little River, source to Hammond Road, Charlton	9.1-8.7	B	no	1976	Dissolved oxygen Coliform bacteria Solids Phosphorus	Massachusetts turnpike westbound WWTP, and wetlands.	To be addressed in the Charlton Facility plan.
Little River from Hammond Road, Charlton to the French River	8.7-0.0	B	no	1976	--	--	--
Quinebaug River above Sturbridge WWTP, Sturbridge	30.7-19.7	B	no	1976	--	--	--
Sturbridge WWTP, Sturbridge to Southbridge WWTP, Southbridge	19.7-12.2	B	yes	1972 1974 1976 1980	Coliform bacteria	Sturbridge WWTP. Urban runoff.	Expansion of the Sturbridge WWTP in design phase.
Southbridge WWTP, Southbridge to the outlet of West Dudley Impoundment	12.2-10.2	B	yes	1972 1974 1976 1980	Coliform bacteria Phosphorus Solids	Southbridge WWTP. Urban runoff.	Advanced secondary treatment at Southbridge.
West Dudley Impoundment to Massachusetts-Connecticut state line	10.2-7.9	B	no	1980	--	--	--
Cady Brook above Charlton Woolen Co., Charlton	6.1-5.1	B	yes	1972 1974 1976	Coliform bacteria	On-site septic systems.	Charlton facility plan to evaluate sewer needs in this area.

TABLE 12 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Charlton Woolen Company, Charlton to the Quinebaug River, Southbridge	5.1-0.0	B	yes	1972 1974 1976	Dissolved oxygen Coliform bacteria Solids Phosphorus	Charlton City WWTP and former discharge at the Charlton Woolen Co.	Advanced secondary treatment at the Charlton City WWTP.
Mill Brook (Brimfield) entire length and Wales Brook (Brimfield) entire length	4.3-0.0 4.9-0.0	B	yes	1976	Coliform bacteria	Suspected faulty subsurface sewage disposal systems and wetlands.	--

Total miles assessed (French and Quinebaug Rivers) - 43.5
Total miles meeting standards (French and Quinebaug Rivers) - 13.7

Total miles assessed (tributaries) - 26.8
Total miles meeting standards (tributaries) - 11.1

HOOSIC RIVER BASIN

Description of the Watershed

The Hoosic River rises in the northwestern corner of Massachusetts and travels through Vermont and parts of New York, where it joins the Hudson River just above Albany. The total watershed area is 713 square miles of which 165 square miles are in Massachusetts. In Massachusetts the river is made up of the mainstem, South Branch, North Branch, Green River and many smaller tributaries.

The North Branch begins in Reedsborough, Vermont and flows southerly through Stanford, Vermont into Clarksburg, Massachusetts. The river continues in a southwesterly direction until joining the South Branch in North Adams. The headwaters of the South Branch rise as far south as Pittsfield. The South Branch itself, however, begins at the outlet of Cheshire Reservoir, Cheshire and flows north through Adams to the confluence with the North Branch in North Adams. From the confluence the mainstem travels in a northwesterly direction through Williamstown to Pownal, Vermont.

The watershed within Massachusetts includes all of the towns of Williamstown, Clarksburg, and Cheshire; practically all of the city of North Adams, the towns of Adams and New Ashford; and small portions of Hancock, Lanesborough, Pittsfield, Dalton, Savoy, Florida, and Windsor. The Hoosic River Valley in Massachusetts has a number of concentrated areas of population, the major areas being the city of North Adams and the towns of Adams and Williamstown.

Due to the past history of high flood damage along the Hoosic River, three gages were built along the banks to monitor flow--one in Williamstown on the mainstem, one in North Adams on the North Branch, and the other in Adams on the South Branch. In addition, gages were built in Williamstown along the Green River, and in Cheshire along Dry Brook.

Portions of the Hoosic River are used as a source of water supply for industrial purposes, while unpolluted tributaries of the river act as water supplies for Adams, Cheshire, North Adams,. and Williamstown.

The major sources of municipal wastes are from the treatment plant in Adams and the Hoosac Water Quality Distric Wastewater Treatment Plant in Williamstown. The major industrial discharge is from Charles Pfizer and Company, Inc., in Adams.

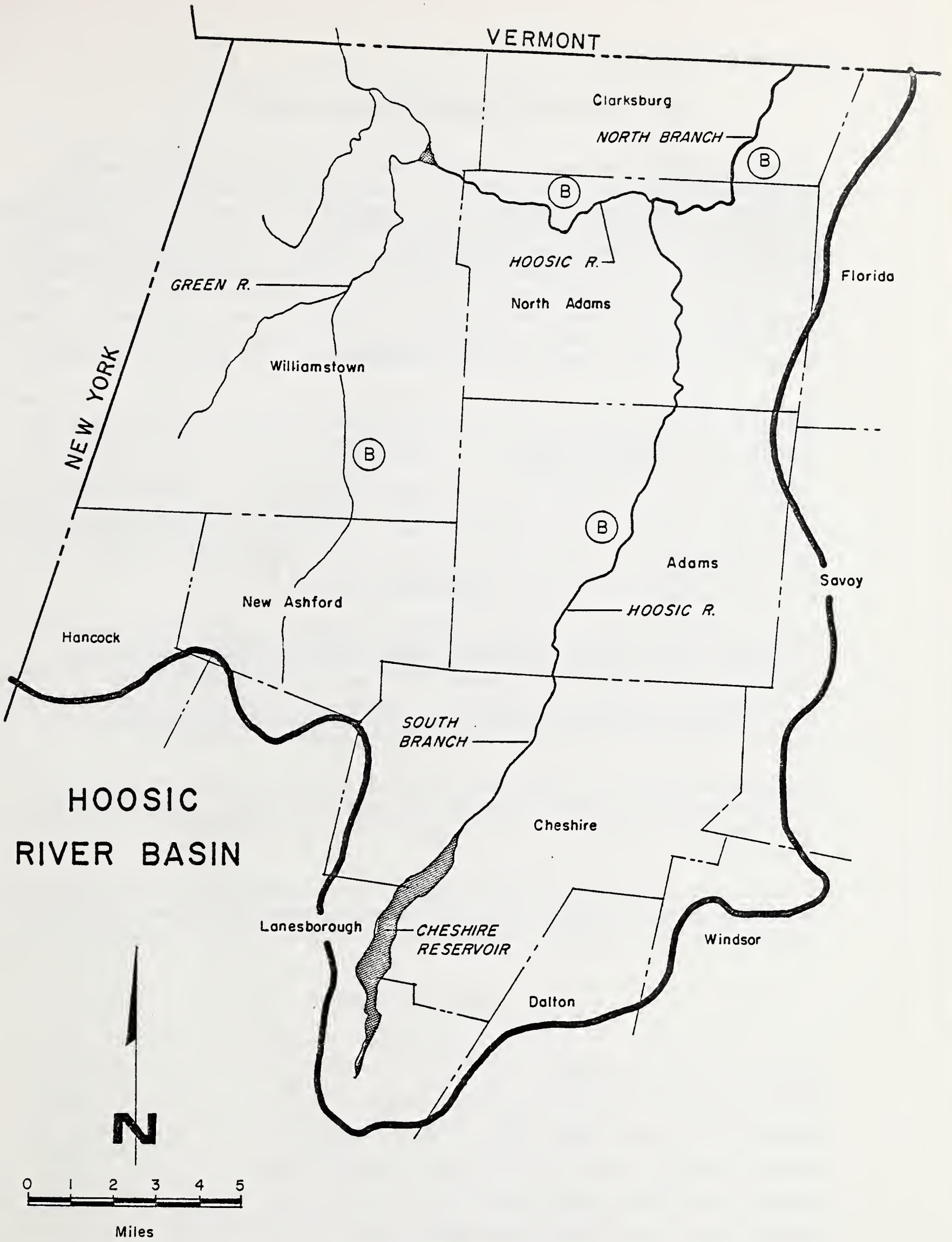

VERMONT
Clarksburg
NORTH BRANCH
B
B
HOOSIC R.
GREEN R.
North Adams
Florida
NEW YORK
Williamstown
B
B
Adams
Savoy
New Ashford
HOOSIC R.
Hancock
SOUTH
BRANCH
HOOSIC
RIVER BASIN
Cheshire
Lanesborough
CHESHIRE
RESERVOIR
Windsor
Dalton
N
0 1 2 3 4 5
Miles

FIGURE 13

Water Quality Conditions and Trends

During the 1960's and early 1970's the Hoosic River received untreated industrial wastewater from a number of industries, primary effluent from municipal wastewater treatment plants, combined sewer overflows, and untreated wastewater discharges from individual residences. Dissolved oxygen concentrations were extremely low during periods of high water temperature and low flow. Fecal coliform concentrations were well above those considered safe for primary and secondary contact recreation. Industrial discharges contributed toxic heavy metals and some PCB's. Fish kills were a common occurrence in the Hoosic River reaches impacted by these discharges. The Hoosic was little else than an assimilator and transporter of the basin's wastewaters.

By the summer of 1973, however, conditions in the Hoosic River had improved markedly. Construction of the Adam's secondary wastewater treatment plant in 1971 and the discontinuance of a number of industrial outfalls were the primary reasons for the improvements. A number of pollution sources still remained to be controlled with consequent water quality violations still occurring. By the fall of 1977, the Hoosac Valley Water Quality District (HVWQD) wastewater treatment plant went on-line. Serving an enlarged sewered area of the HVWQD towns and tying in the remaining industries which had still been discharging directly to the Hoosic, water quality protection was afforded to the North Adams-Williamstown reaches of the Hoosic.

Although the abatement projects through the last decade have resulted in significant improvements in overall water quality, a number of concerns remain to be addressed. The reports of occasional fish kills, the overloading of the municipal plants by industrial input due to ineffective pre-treatment, high coliform bacteria concentrations, and the possibility of heavy metal and PCB contamination remain to be investigated.

The major tributary to the Hoosic River is the Green River. This shallow, well-aerated stream drains rural pasture and farm land. Two discharges to the stream are apparently well assimilated with no significant water quality violations.

Tophet Brook in Adams and Hemlock Brook in Williamstown are minor tribuaries which have been surveyed by the Massachusetts Division of Water Pollution Control. No water quality violations were evident from the survey's results.

Lakes and Ponds

Inventory

Number of lakes and ponds	17
Surface area of lakes and ponds (in acres)	616
Number of lakes and ponds greater than 10 acres	7
Surface area of lakes and ponds greater than 10 acres	586
Number of officially recognized Great Ponds	--
Surface area of officially recognized Great Ponds (in acres)	--

Intensive Survey

Lake	Location	Survey Period	Report Publication Date
Cheshire Reservoir	Cheshire/Lanesborough	1980	June 1981

Classification

Lake	Location	Stratification	Severity Points
Berkshire Pond	Lanesborough	U	11
Cheshire Reservoir	Cheshire/Lanesborough	U	7

References

Massachusetts Division of Water Pollution Control. 1975. Hoosic River Basin Water Quality Management Plan 1975. Westborough, Massachusetts. 67 pp.

_____. 1978. The Hoosic River Part A Water Quality Data 1977-1978. Westborough, Massachusetts 84 pp.

TABLE 13

HOOSIC RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
South Branch Hoosic River from outlet Cheshire Reservoir, Cheshire to Adams WWTP, Adams	21.5-13.6	B	no	1977 1978	None	None	--
South Branch Hoosic River from Adams WWTP to Brown Street bridge, North Adams (0.2 miles below confluence with North Branch Hoosic River)	13.6-8.1	B	yes	1977 1978	Fecal coliform Suspended solids Toxic metals Possible PCB	Adams WWTP. Industrial discharges in North Adams.	Industrial pretreatment; improved solids handling facilities at Adams WWTP. Sampling program to determine if problem exists (instream and plant discharges).
North Branch Hoosic River to Brown Street bridge, North Adams (0.2 miles below confluence with South Branch Hoosic River)	4.9	B	yes	1977 1978	Fecal coliform	Clarksburg septic systems, residential wastewater discharges.	1982 water quality survey will document the effect of recent sewering of the area.
Hoosic River at Brown Street bridge, NorthAdams, to Route 346 bridge, Pownal, Vermont	8.1-2.0	B	yes	1977 1978	Fecal coliform	Urban runoff, upstream sources.	1982 water quality survey might show alleviation of problem if upstream sources controlled as anticipated.
Green River, New Ashford, to confluence with Hoosic River, Williamstown	10.8-0.0	B	yes	1977 1978	Fecal coliform	Possible: inadequate disinfection at the two permitted discharges; farm animals; malfunctioning septic systems.	Identification of source(s); required abatement.

TABLE 13 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Tophet Brook, Adams to confluence with South Branch Hoosic River, Adams	1.1-0.0	B	no	1977	None	--	--
Hemlock Brook, Williamstown to confluence with Hoosic River, Williamstown	3.5-0.0	B	no	1978	None	--	--

Total miles assessed (Hoosic River) - 24.4
Total miles meeting standards (Hoosic River) - 7.9

Total miles assessed (tributaries) - 15.4
Total miles meeting standards (tributaries) - 4.6

HOUSATONIC RIVER BASIN

Description of the Watershed

The Housatonic River rises in western Massachusetts and travels south 131 miles through Massachusetts and Connecticut to Long Island Sound. The total watershed area is 1,950 square miles, of which approximately 500 square miles are in Massachusetts.

The Housatonic Basin in Massachusetts has a maximum east-west width of 19 miles and a maximum length in a north-south direction of 38 miles. The valley is bordered on the west by the Taconic Range and on the east by the Berkshire Hills. The valley is relatively steep and narrow at the headwaters of its branches, but broadens and flattens as it nears Connecticut.

The Housatonic River in Massachusetts consists of the main stem, East, West, and Southwest branches, and many major tributaries, including the Williams and Green rivers.

Water Quality Conditions and Trends

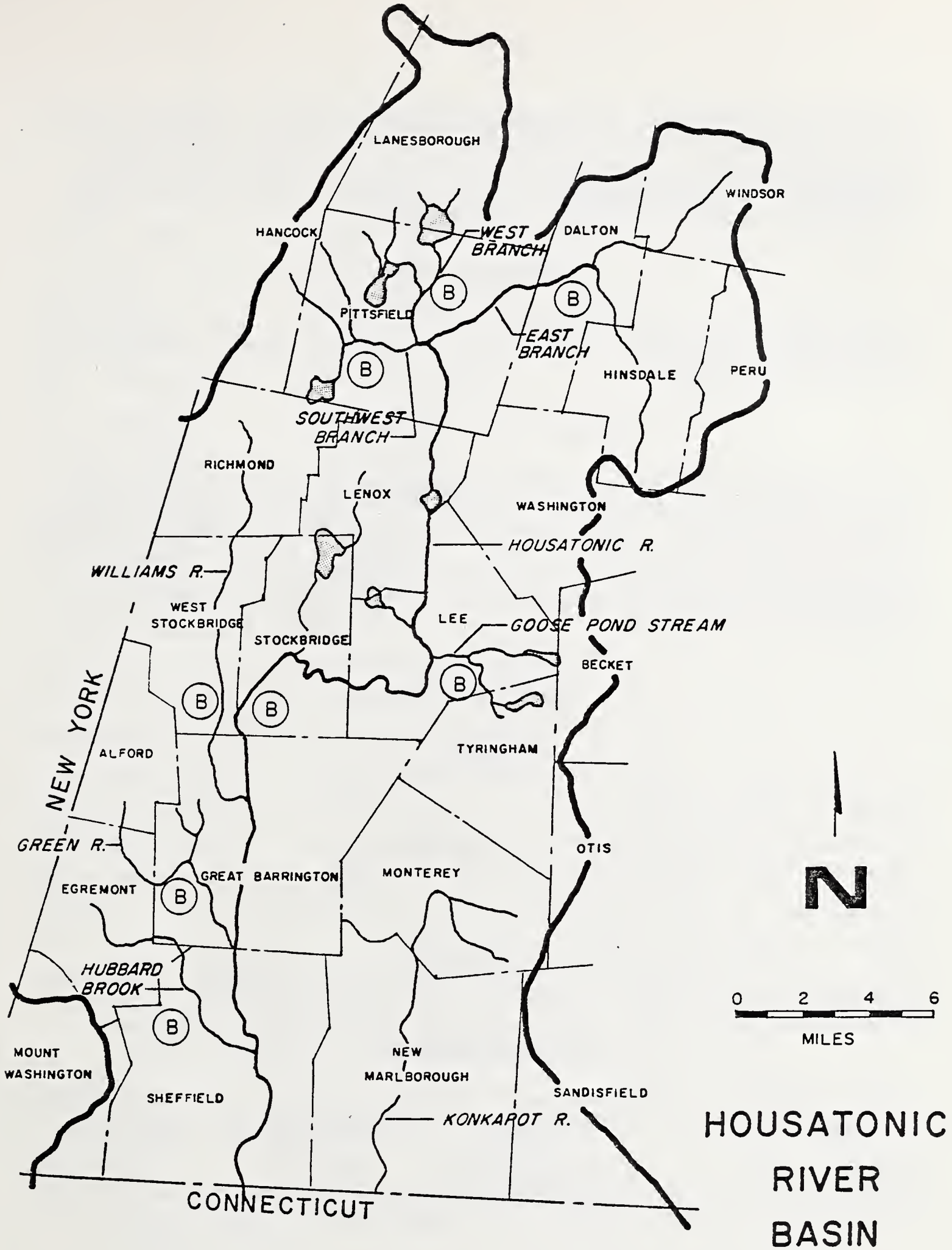
Dissolved Oxygen

Minor dissolved oxygen violations continue downstream of the Crane Paper Company discharge in the East Branch. Early morning dissolved oxygen levels typically reach minima of 3.5-4.5 mg/l in the summer. Below the confluence of the West and East Branches, dissolved oxygen levels consistently meet the standard of 5 mg/l.

Improvement in dissolved oxygen levels is significant below the Pittsfield WWTP. Dissolved oxygen depletion in Woods Pond (1.5 miles downstream from the Pittsfield WWTP discharge) discontinued when the Pittsfield WWTP was upgraded.

Coliform Bacteria

There are coliform violations in the East Branch at Pittsfield, the Housatonic River at Stockbridge, and suspected violations in the Williams River at West Stockbridge. The violations in Pittsfield may be from some cross-connections between storm and sanitary sewers. Violations below the Stockbridge WWTP result from its undisinfected effluent; West Stockbridge presently has no treatment capabilities and discharges untreated sewage to the Williams River.



HOUSATONIC RIVER BASIN

FIGURE 14

Significant improvement is apparent in the East Branch at Hinsdale, the Housatonic River at Great Barrington and is suspected at the Housatonic River at Woods Pond. The improvements are due to Hinsdale and north Lenox tying into the Pittsfield Sewerage District, and Great Barrington completing a secondary treatment facility.

Oil and Grease

An intermittent slick is observable in the East Branch and the Housatonic River through Woods Pond. It is caused largely by non-point sources in the Pittsfield area.

Polychlorinated Biphenyls

The Housatonic River is contaminated by polychlorinated byphenyls (PCB) from the East Branch at Pittsfield through the Housatonic River to the Connecticut boundary. This contamination disallows the river from meeting standards under Regulation 3.4 (A.7). PCB has not been discharged to the river since 1977, but in-place sediments continue to cause problems. Warnings have been posted along the river which describe possible PCB contamination of fish.

Lakes and Ponds

Inventory

Number of lakes and ponds	113
Surface area of lakes and ponds (in acres)	5,134
Number of lakes and ponds greater than 10 acres	70
Surface area of lakes and ponds greater than 10 acres	4,934
Number of officially recognized Great Ponds	17
Surface area of officially recognized Great Ponds (in acres)	2,882

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Pontoosuc Lake	Pittsfield/ Lanesborough	1975-1976	April 1978

Classification

Lake	Location	Stratification	Severity Points
Ashmere Lake	Hinsdale/Peru	U	3
Lake Buel	Monterey/New Marlborough	S	10
Card Pond	West Stockbridge	U	4
Center Pond	Dalton	U	5
East Indies Pond	New Marlborough	U	3
Lake Garfield	Monterey	S	9
Goodrich Pond	Pittsfield	S	14
Goose Pond	Lee/Tyringham	S	2
Greenwater Pond	Becket	S	3
Laurel Lake	Lee/Lenox	S	8
Onota Lake	Pittsfield	S	4
Plunkett Reservoir	Hinsdale	S	3
Pontoosic Lake	Pittsfield/Lanesborough	S	11
Prospect Lake	Egremont	U	3
Richmond Pond	Pittsfield/Richmond	S	3
Shaker Mill Pond	West Stockbridge	U	4
Stockbridge Bowl	Stockbridge	S	9
Upper Goose Pond	Lee/Tyringham	S	4
Woods Pond	Lenox	U	17

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TABLE 14

HOUSATONIC RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Housatonic River from Pittsfield to Connecticut boundary, Sheffield	55.4-0.0	B	yes	1980 1981 1978	PCB	In-place sediments. Stockbridge WWTP.	Studies unterway to determine best method of action. Facilities planning underway to upgrade Stockbridge WWTP.
East Branch from Hinsdale to Crane Paper Company, Pittsfield	13.6-5.1	B	no	1977	--	--	--
East Branch from Crane Paper Company to confluence with West Branch, Pittsfield	5.1-0.0	B	yes	1977 1978 1981	Dissolved oxygen	Unknown	--
West Branch from source to confluence with East Branch, Pittsfield	4.7-0.0	B	no	1978	--	--	--
Williams River from source to West Stockbridge	10.5-8.6	B	yes	1978	Suspected coliform bacteria	Untreated sanitary discharges.	Facilities planning underway for West Stockbridge.
Williams River from West Stockbridge to the confluence with the Housatonic River, Great Barrington	8.6-0.0	B	no	1978	None	--	--

Total miles assessed (Housatonic River) - 73.7
Total miles meeting standards (Housatonic River) - 13.2

Total miles assessed (tributaries) - 10.5
Total miles meeting standards (tributaries) - 8.6

IPSWICH RIVER BASIN

Description of the Watershed

The Ipswich River Basin is located in northeastern Massachusetts and encompasses a drainage area of 155 square miles. All or part of nineteen Massachusetts communities lie within the Ipswich drainage basin. The towns of Middleton, Topsfield, and North Reading lie completely within the basin, as do major portions of Boxford, Hamilton, North Andover, Reading, Wenham, and Wilmington.

The river rises in the town of Burlington and follows a meandering northeasterly course to the town of Ipswich, where it drains into the Atlantic Ocean. The major tributaries to the Ipswich River are Martins Brook, Boston Brook, Fish Brook and the Miles River.

From its source to its mouth, the Ipswich River experiences a vertical fall of 115 feet, of which approximately 30 feet are taken up by the three dams on the river. At its mouth, the river has a total drainage area of 155 square miles with an average discharge of 249 cubic feet-per-second (cfs) to the Atlantic Ocean. The United States Geological Survey (USGS) maintains two flow gaging stations on the Ipswich River. One is located in south Middleton and the other is located downstream at the Willowdale Dam in Ipswich. The average discharge at the south Middleton gage is 69 cfs, while the average discharge at the Ipswich gage is 198 cfs.

The total stream discharge is affected by several water supply diversions which occur regularly during high flow periods and intermittently during low flow periods. Beverly, Lynn, Peabody and Salem divert water from the Ipswich River to augment their water supplies. In addition, twelve other towns have water rights to the Ipswich River.

Water Quality Conditions and Trends

The Ipswich River Basin is a significant water supply source for numerous communities in northeastern Massachusetts. Groundwater and surface water sources are collectively utilized and create a critical interaction between the two sources. The base flow in the Ipswich River is derived mainly from the groundwater. During conditions of low stream flow, large withdrawals of groundwater can significantly lower the stream flow. On some occasions, groundwater withdrawal has completely depleted surface water flow in the central portion of the river.

Due to the significant demands upon the water resources of the Ipswich River Basin, great effort and regulation has been expended to protect the

IPSWICH RIVER BASIN

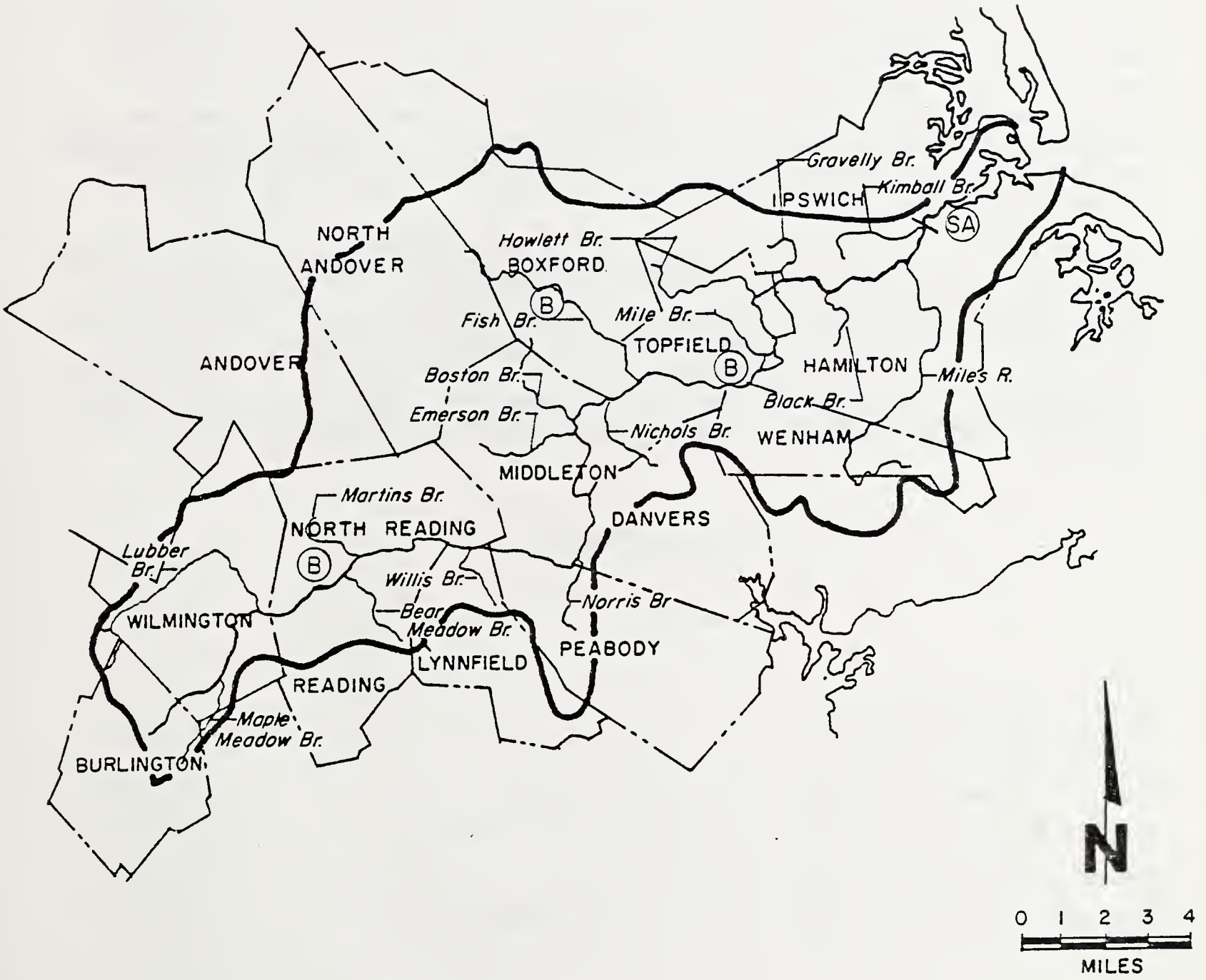

FIGURE 15

stream's water quality. The entire freshwater portion of the Ipswich River has been classified as anti-degradation and is subject to Regulation 4.3, protection of low flow waters (see Appendix 1).

Within the boundaries of the Ipswich River Basin, there are ten wastewater discharges which have NPDES discharge permits. The majority of the discharges are non-contact cooling water and are not considered to cause water quality problems. The town of Ipswich WWTP is the only discharge in the basin which is classified as major. This discharge, which discharges to a small tributary to the estuarine portion of the Ipswich River, was upgraded in 1976 and does not create water quality problems.

The Ipswich River and several of its tributaries are subject in the summer time to depleted dissolved oxygen levels throughout its freshwater portion. The cause is related to the wetland nature of the stream and the associated oxygen demand of the organic matter inherent in wetlands. This condition is not the result of a point source discharge or other man induced condition and therefore, it is not a violation of the Commonwealth's water quality standards. The depressed dissolved oxygen levels may create a physiological stress for the aquatic fauna of these waters.

In the river in the vicinity of the towns of North Reading and Ipswich, stream sample analyses indicated the presence of coliform bacteria in excess of the Commonwealth's water quality standards. The bacteria is associated with septic tank leachate, stormwater runoff, or illegal discharge of untreated sewage. The town of Ipswich has implemented a program to correct many of the problems in the town. It is presumed that this program will reduce the water quality problems and that the water quality of the Ipswich River will reflect class B quality.

Lakes and Ponds*

Inventory

Number of lakes and ponds	75
Surface area of lakes and ponds (acres)	1,980
Number of lakes and ponds greater than 10 acres	36
Surface area of lakes and ponds greater than 10 acres	1,775
Number of officially recognized Great Ponds	5
Surface area of officially recognized Great Ponds (acres)	213

Classification

Lake	Location	Stratification	Severity Points
Hood Pond	Topsfield/Ipswich	S	6
Lowe Pond	Boxford	U	5
Martins Pond	North Reading	U	10
Pentucket Pond	Georgetown	S	14
Rock Pond	Georgetown	U	10
Stiles Pond	Boxford	S	8

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* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Ipswich River Basin.

TABLE 15

IPSWICH RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
From its source in Wilmington to Chestnut Street, North Reading	41.1-33.0	B	no	1973 1978	Dissolved oxygen	Natural wetland condition.	None
Chestnut Street, North Reading to Route 114, Middleton	33.0-28.6	B	yes	1973 1978	Coliform bacteria	Stormwater. Leachate. Untreated discharge.	Non-point control in North Reading.
Route 114, Middleton to Sylvania Dam, Ipswich	28.6-4.5	B	no	1973 1978	--	--	--
Sylvania Dam, Ipswich to mouth in Ipswich Bay	4.5-0.0	SA	yes	1973 1978	Coliform bacteria	Stormwater. Untreated discharges.	Program on-going to connect problem areas to WWTP.

Total miles assessed - 41.1

Total miles meeting classification - 32.2

THE ISLANDS DRAINAGE AREAS

Description of the Islands

The Islands drainage areas include those of Nantucket, Martha's Vineyard, and the Elizabeth Islands, all located off the southern coast of Cape Cod. These islands collectively exhibit similar geological patterns, water resources, and water quality problems. Ponds constitute the major type of surface freshwater resources and groundwater is the sole source of domestic water supply.

Nantucket is an island comprising 49.5 square miles, 94 miles of coastline and with a maximum elevation of about 100 feet. Martha's Vineyard is an island consisting of six towns. It has a total surface area of 105.9 square miles, 125 miles of shoreline, and a maximum elevation of approximately 130 feet. One town, Gosnold is located on the separate Elizabeth Islands. All of the islands have small wintertime populations that swell to much larger numbers during the summer vacation season.

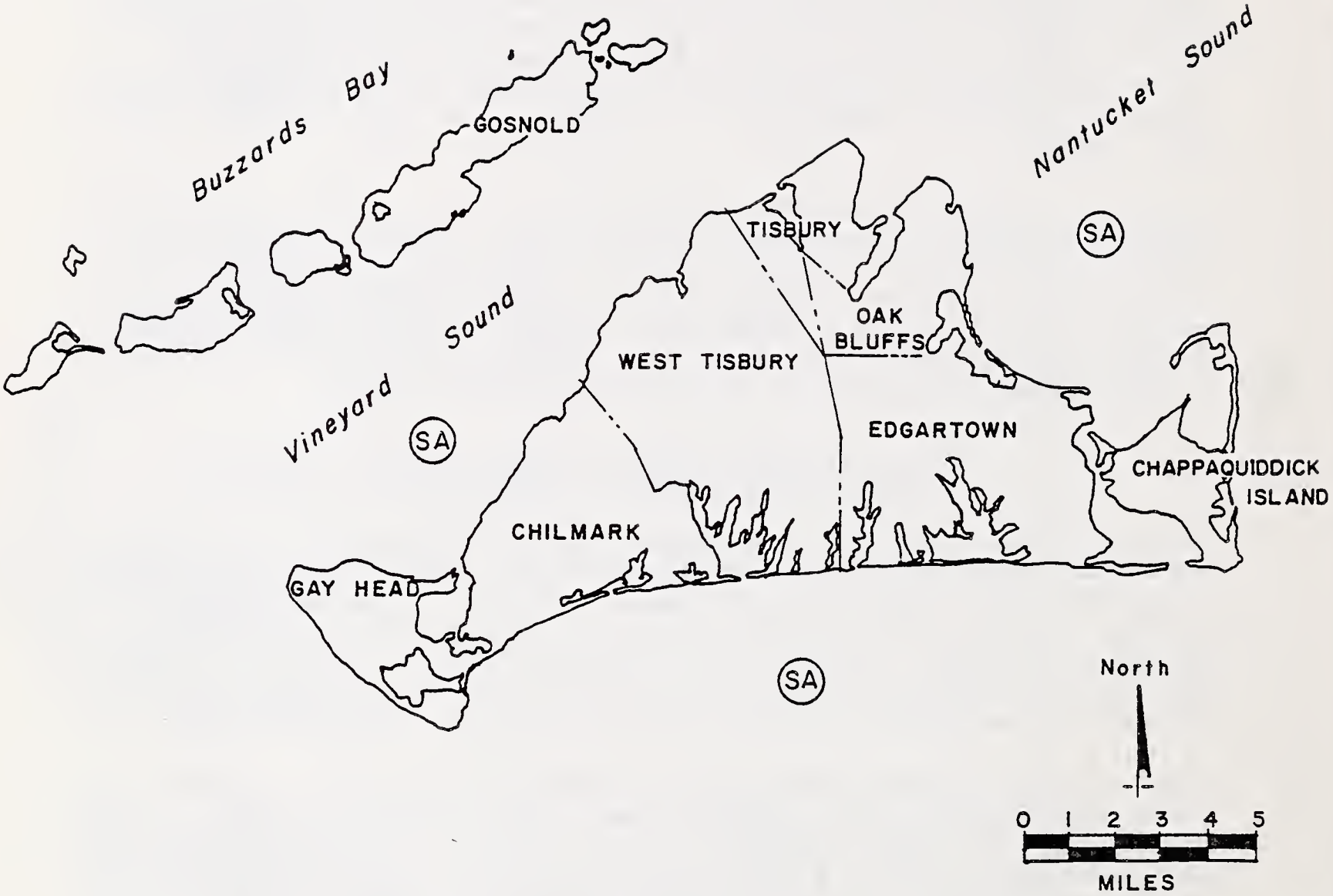
Water Quality Conditions and Trends

With the summer population of Nantucket rapidly approaching 30,000 and an additional 500,000 tourists visiting each year, there are potential threats to surface water quality and groundwater. Potential impacts are from septic systems, leachate from landfill disposal of septage and solid wastes and saltwater intrusion. Coastal waters are threatened by possible oil spills from tanker traffic and offshore oil exploration, and by sanitary waste discharges from watercraft, particularly those moored in harbors.

There are no industrial wastewater discharges on Nantucket. A thermal discharge to Nantucket Harbor presently meets water quality standards. At the present time the island utilizes two sand beds for sanitary waste treatment with subsequent landfill disposal. Discharges of untreated sanitary wastes to Nantucket Harbor occur occasionally from the Sea Street Pumping Station bypass. For this reason, plus the heavy boating traffic, Nantucket Harbor is closed to shellfish harvesting.

Potential water quality problems on Martha's Vineyard are similar to those on Nantucket and are related to heavy use of septic systems, landfill leachate, watercraft waste, stormwater runoff, and oil spillage. Presently there are two sanitary waste treatment plants on Martha's Vineyard, one of which discharges to a sand filter and the other to a leaching field.

The town of Gosnold on the Elizabeth Islands has two small untreated sewage discharges to Vineyard Sound. To guard against future deterioration of



THE ISLANDS BASIN
MARTHA'S VINEYARD

FIGURE 16 -A.

THE ISLANDS BASIN
NANTUCKET

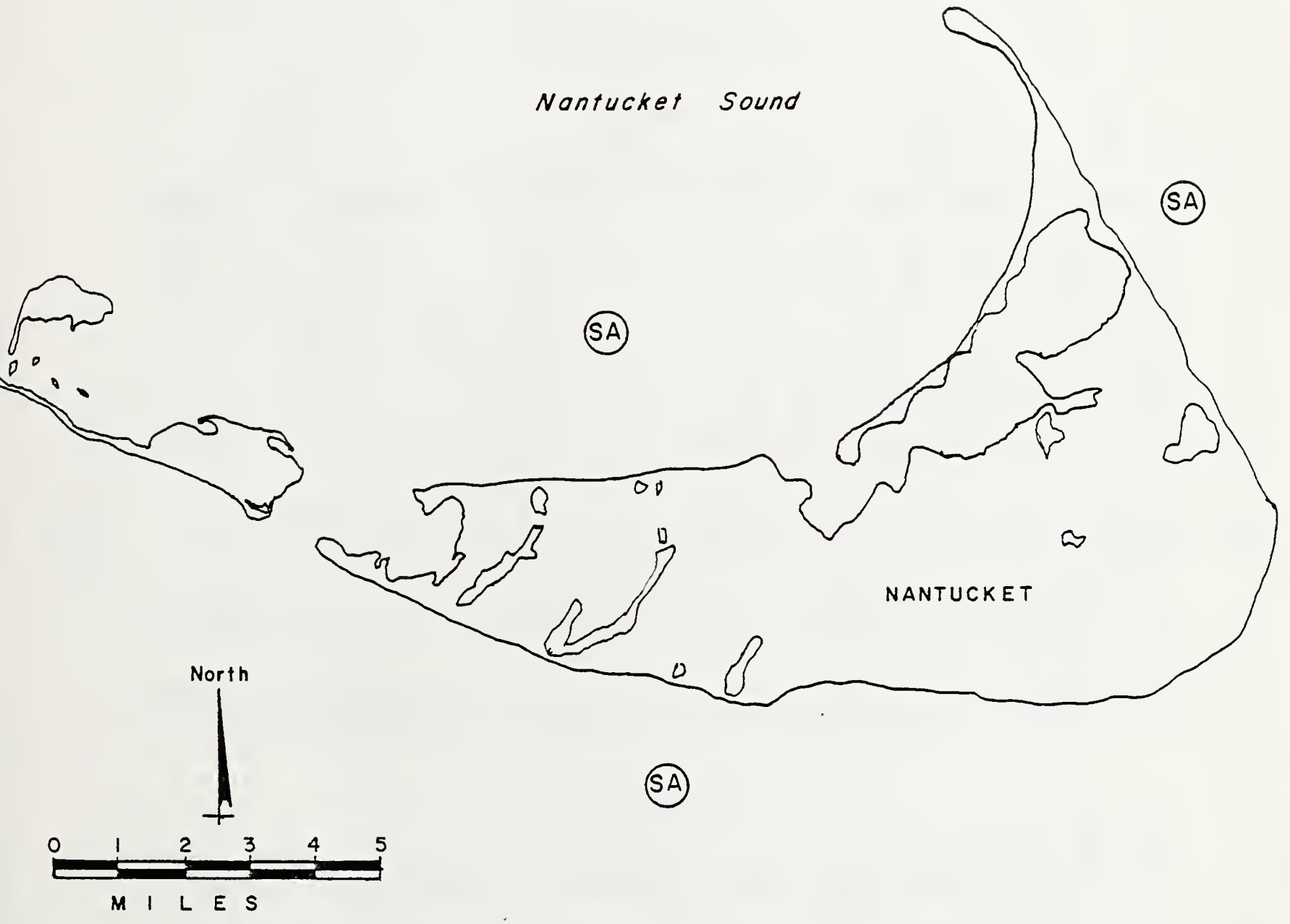


FIGURE 16-B

coastal waters and groundwater supplies, current planning efforts are centered around methods for disposing increasing amounts of septage and maintaining existing septic systems.

Despite the above mentioned potential problem areas, the overall water quality of Nantucket and Martha's Vineyard is excellent. Future land-use planning and proper water quality management should serve to maintain the quality of the water on the islands.

Lakes and Ponds

Inventory

Islands Drainage Area	Elizabeth Islands	Martha's Vineyard	Nantucket	Total
Number of lakes and ponds	13	62	28	103
Surface area of lakes and ponds (acres)	324	6,146	952	7,422
Number of lakes and ponds greater than 10 acres	5	42	17	64
Surface area of lakes and ponds greater than 10 acres	299	6,011	885	7,195
Number of officially recognized Great Ponds	-	4	2	6
Surface area of officially recognized Great Ponds (acres)	0	1,429	506	1,935

(Included in this inventory are some saltwater and brackish ponds.)

References

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* No intensive surveys or baseline surveys have been undertaken by the Division's Technical Services Branch in the Islands Drainage Area.

TABLE 16

ISLANDS BASIN

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Nantucket Harbor	SA	no	1978	--	--	--
Long Pond, Nantucket	B	no	1978	--	--	--
Hummock Pond, Nantucket	B	no	1978	--	--	--
Maxcy Pond, Nantucket	B	no	1978	--	--	--
Washing Pond, Nantucket	B	no	1978	--	--	--
Miacomet Pond, Nantucket	B	no	1978	Coliform bacteria	Failing septic systems.	Proper maintenance of subsurface disposal systems.
Tom Nevers Pond, Nantucket	B	no	1978	--	--	--
Gibbs Pond, Nantucket	B	no	1978	Nutrients	Unknown	--
Sesachacha Pond, Nantucket	SA	no	1978	Nutrients	Natural	--
Chilmark Pond, Martha's Vineyard	SA	no	1975 1976	--	--	--
Menemsha Pond, Martha's Vineyard	SA	no	1975 1976	Coliform bacteria	Failing septic systems.	Proper maintenance of subsurface disposal systems.
Oak Bluffs Harbor, Martha's Vineyard	SA	no	1975 1976	--	--	--
Vineyard Haven Harbor, Martha's Vineyard	SA	no	1975 1976	Coliform bacteria	Failing septic systems.	Septic system maintenance.
Sengekontacket Pond, Martha's Vineyard	SA	no	1975 1976	Coliform bacteria	Failing septic systems.	Septic system maintenance.
Lagoon Pond, Martha's Vineyard	SA	no	1975 1976	Coliform bacteria	Failing septic systems.	Septic system maintenance.

TABLE 16 (CONTINUED)

SEGMENT DESCRIPTION	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Seth's Pond, Martha's Vineyard	B	no	1975 1976	Solids	Septic system failures.	Septic system maintenance.
Duarte Pond, Martha's Vineyard	B	no	1975 1976	--	--	--
Lake Tashmoo, Martha's Vineyard	SA	no	1975 1976	--	--	--
Cories Pond, Martha's Vineyard	B	no	1975 1976	--	--	--
Maltakeset Bay, Martha's Vineyard	SA	no	1975 1976	--	--	--
Black Brook, Martha's Vineyard	B	yes	1975 1976	Solids Heavy metals	Landfill suspect.	--
Mill Brook, Martha's Vineyard	B	no	1975 1976	--	--	--
Roaring Brook, Martha's Vineyard	B	no	1975 1976	--	--	--
Paint Mill Brook, Martha's Vineyard	B	no	1975 1976	--	--	--
Tiasquam River, Martha's Vineyard	B	no	1975 1976	Solids	Septic system failures.	Septic system maintenance.
Smith Brook, Martha's Vineyard	B	no	1975 1976	--	--	--

Total number of segments assessed - 26
Total number of segments meeting standards - 25

MERRIMACK RIVER BASIN

Description of the Watershed

The Merrimack River is formed in Franklin, New Hampshire at the confluence of the Pemigewasset and Winnipesaukee rivers. It flows southward for 78 miles through the central portion of New Hampshire and into Massachusetts. Near the city of Lowell, Massachusetts the river turns to the northeast and flows 38 miles to the city of Newburyport where it empties into the Atlantic Ocean. The Merrimack River drainage basin, fourth largest in New England, is comprised of a total of 5,010 square miles in New Hampshire and Massachusetts. Only 24 percent, or approximately 1,200 square miles, of the watershed are located within the Commonwealth of Massachusetts.

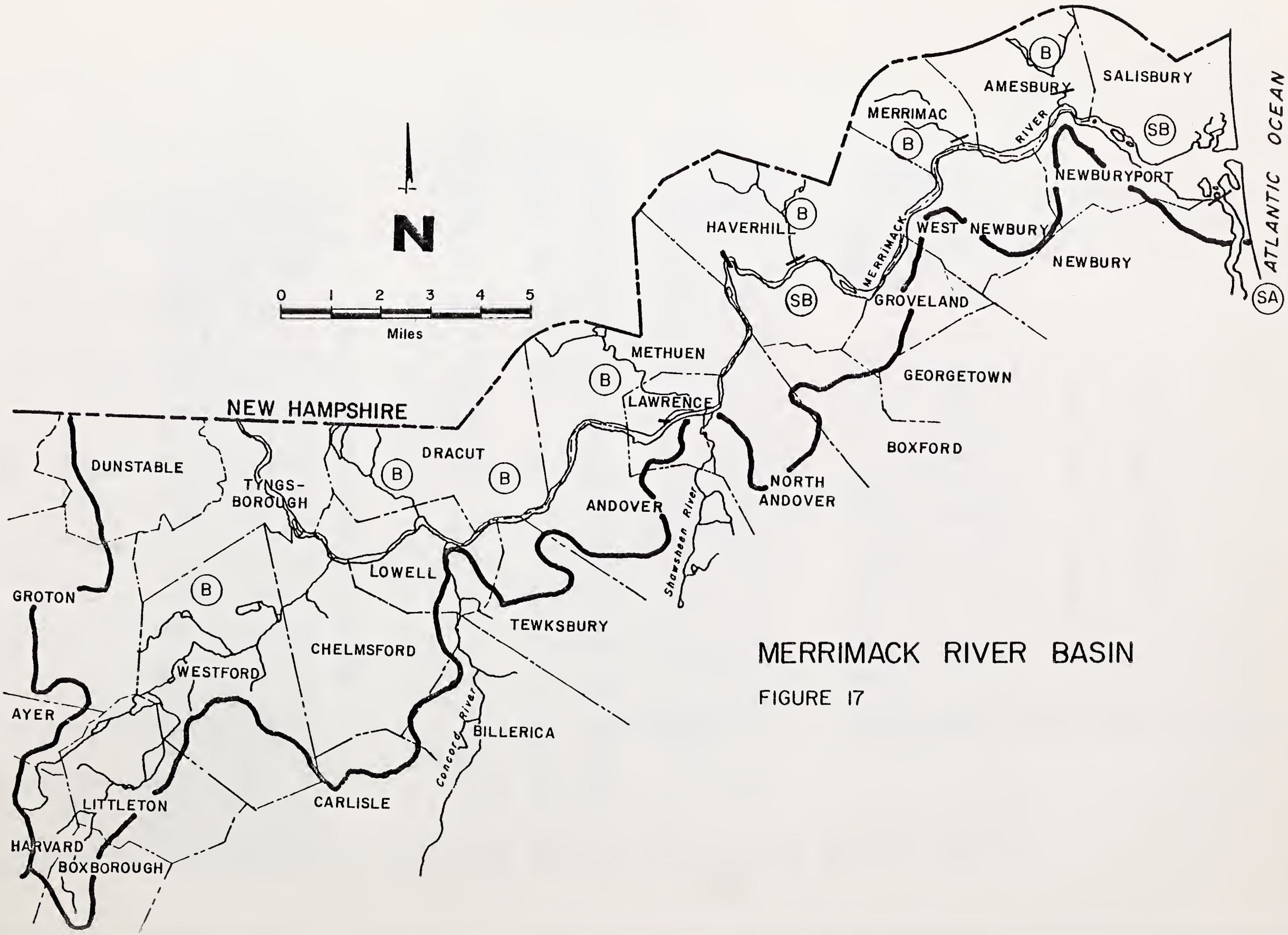
From the state line to the Merrimack estuary, a distance of 50 miles, the river drops 90 feet in elevation. This drop includes flow over major dams in the cities of Lowell and Lawrence which also mark the location of significant flow diversions through extensive canal systems. The United States Geological Survey (USGS) maintains a flow monitor on the Merrimack River at Lowell. The average discharge at this gage over 55 years of record is 7,474 cubic feet per second (cfs) and the seven-day, ten-year low flow is approximately 940 cfs.

Major sub-watersheds within the Massachusetts portion of the Merrimack River drainage basin are the Nashua (530 $mi.^2$), Stony Brook (51 $mi.^2$), SuAsCo (406 $mi.^2$), and Shawsheen (72 $mi.^2$). Other smaller tributaries include Beaver Brook, Spicket River, Little River, and Powwow River.

The maximum length of the Merrimack estuary is nine miles. It drains a total of 4,208 acres of salt marsh. The surface area of the estuary at mean low water is 3.29 $mi.^2$ At mean high water the surface area is 6.18 $mi.^2$ and the total volume is 1,884,405,600 cubic feet. The effects of the ocean tides extend 22 miles upstream to Haverhill.

Water Quality Conditions and Trends

For many years prior to the 1970's the water quality of the mainstem Merrimack River in Massachusetts was adversely impacted by a number of pollution sources. These included large volumes of untreated sewage that were released to the river in the cities of Lowell, Lawrence, and Haverhill, and the addition of contaminants from polluted tributaries such as the Nashua River which flows into the Merrimack River in Nashua, New Hampshire. An estimated BOD_5 loading of from 65-75 thousand pounds per day was discharged directly to the Merrimack from the three above mentioned cities.



MERRIMACK RIVER BASIN

FIGURE 17

Despite heavy organic loadings to the river in the larger cities in New Hampshire and Massachusetts, the Merrimack River did not exhibit severe dissolved oxygen depletion during most times of the year primarily due to the large amount of flow that served to dilute incoming wastes. During summer months when flow in the river was much lower, dissolved oxygen concentrations violated water quality standards. Furthermore, concentrations of plant nutrients such as nitrogen and phosphorus, and coliform bacteria counts were high. The presence of elevated concentrations of nitrogen and phosphorus in the water contributed to a significant diurnal dissolved oxygen fluctuation.

One of the most devastating impacts resulting from water quality degradation in the Merrimack River was on the shellfish industry located in the estuary. A recent report published jointly by the Massachusetts Department of Environmental Quality Engineering (MDEQE) and the Merrimack Valley Planning Commission describes the tidal flats of the Merrimack River Estuary and presents a historical record of their annual production. The flats comprise a total of over 850 acres which, at the turn of the century, were yielding almost 100,000 bushels of soft shell clams annually. Worsening water quality conditions in the Merrimack River led to closure of some shellfish flats as early as 1925. By the 1950's and 60's annual production had decreased to a few hundred bushels, making the shellfish industry virtually non-existent in the Merrimack estuary.

By the early 1960's, poor water quality conditions were severely limiting the beneficial uses of the Merrimack River. As a result, a program was initiated to ameliorate water pollution problems in the river. Environmental legislation such as the Federal Water Pollution Control Act (PL92-500) provided funding for the construction of municipal wastewater treatment facilities and the elimination of direct river discharges of untreated sewage or industrial wastes. Today, secondary wastewater treatment facilities are operating in Lowell, Lawrence, Haverhill, and Amesbury. Recent compliance monitoring and river sampling results indicate that BOD_5 loadings from Lowell, Lawrence, and Haverhill have been reduced to approximately 15,000 lbs/day, representing an 80% reduction from earlier loadings. In addition, construction of a treatment facility has begun in the town of Merrimac and work has been initiated to upgrade the primary facility in the city of Newburyport to a secondary plant.

Water quality improvements resulting from the construction of wastewater treatment facilities are readily apparent upon examination of 1979 and 1981 water quality survey data. Dissolved oxygen content in the river is now at or near saturation throughout most of the Massachusetts portion of the Merrimack River. Furthermore, coliform bacteria counts have decreased significantly in segments of the river immediately downstream from urban areas.

Water quality problems do still exist in the Merrimack River. Whereas oxygen demand has been drastically reduced, nutrients are still present in

concentrations which promote the growth of phytoplankton. Nitrogen and phosphorus from upstream sources concentrate in the impoundment behind the Essex Dam in Lawrence, causing algal blooms in the summer months. A characteristic diurnal dissolved oxygen fluctuation occurs throughout much of the river. The major sources of pollution in the lower Merrimack River today are combined sewer overflows (CSO) in the old urban centers of Lowell, Lawrence, and Haverhill. In addition, untreated sewage is released to the Merrimack River in portions of Lowell that still remain to be connected to the new wastewater treatment plant at Duck Island. The CSO and untreated discharges are indicated mainly by high coliform bacteria counts downstream from the three aforementioned cities. Bacteria levels steadily decrease downstream from the city of Haverhill due to both natural die-off and dilution. Despite the existence of a number of local sources of pollution around the Merrimack Estuary, such as sewage loadings to Black Rock Creek in Salisbury, the impacts on water quality of pollutants originating upstream are lessened by the flushing action of the tides.

Major tributaries to the Merrimack River in Massachusetts are the Nashua and Concord rivers which are treated in separate sections of this report. Smaller tributaries from which water quality data are available are discussed below.

Stony Brook is subjected to small industrial discharges as well as non-point loadings which contribute nutrients in large enough quantities to promote the growth of algae and aquatic macrophytes. This is particularly evident in the many impoundments along the brook. Diurnal dissolved oxygen fluctuation is apparent during the summer months but Class B standards are rarely violated. A slight coliform bacteria problem becomes severe just above the confluence with the Merrimack River as the result of urban runoff and suspected wastewater discharges.

High coliform bacteria levels are exhibited in Beaver Brook in Lowell. They are the result of wastewater discharges in Dracut and Lowell. Dissolved oxygen depletion, however, is minimized by the reaeration characteristics of Beaver Brook.

The Spicket River exhibits severe dissolved oxygen depletion, elevated bacteria counts, and increased nutrient levels from municipal and industrial discharges in Salem, New Hampshire and Lawrence, Massachusetts.

Due to its low flow characteristics and many wastewater discharges, the Little River (Haverhill) exhibits extreme water quality problems. At times dissolved oxygen concentrations fall to 0.0 mg/l just upstream from the confluence with the Merrimack River. Solids content, turbidity, and color values are often very high.

Class B standards violations occur in the Powwow River as the result of urban runoff and municipal and industrial discharges in Amesbury center. The town is currently undergoing facilities planning to expand the existing sewerage system.

Chlorinated sewage from Salisbury causes severe water quality problems in Black Rock Creek. High solids content and severe dissolved oxygen depletion are exhibited. Furthermore, coliform bacteria levels are very high. A wastewater treatment facility is proposed for the town of Salisbury.

Lakes and Ponds

Inventory

Number of lakes and ponds	76
Surface area of lakes and ponds (in acres)	4,012
Number of lakes and ponds greater than 10 acres	41
Surface area of lakes and ponds greater than 10 acres	3,817
Number of officially recognized Great Ponds	10
Surface area of officially recognized Great Ponds (in acres)	1,270

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Lake Attitash	Amesbury/Merrimac	1977-1978	May, 1980
Flint Pond	Tyngsborough	1976-1977	*
Nabnasset Pond	Westford	1976-1977	*

Classification

Lake	Location	Stratification	Severity Points
Althea Lake	Tyngsborough	S	11
Lake Attitash	Amesbury/Merrimac	U	5
Flint Pond	Tyngsborough	U	7
Flushing Pond	Westford	S	7
Forest Lake	Methuen	S	7
Forge Pond	Westford/Littleton	S	11
Keyes Pond	Westford	S	9

* Abbreviated intensive survey, data held in files at the Division of Water Pollution Control in Westborough, Massachusetts

Classification (Continued)

Lake	Location	Stratification	Severity Points
Long Pond	Dracut/Tyngsborough	S	5
Long-Sought-for Pond	Westford	S	6
Lost Lake/Knops Pond	Groton	S	7
Mascuppic Lake	Dracut/Tyngsborough	S	14
Mill Pond	Littleton	U	12
Nabnasset Pond	Westford	U	7
Peters Pond	Dracut	S	11
Uptons Pond	Tyngsborough	S	11

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TABLE 17

MERRIMACK RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Merrimack River from Mass.-N.H. line to Tyngsborough Bridge	49.8-47.4	B	yes	1979 1981	Coliform bacteria	N.H. discharges Nashua River.	City of Nashua WWTP upgrading from primary to secondary treatment is in design phase.
Merrimack River from Tyngsborough Bridge to Pawtucket Dam, Lowell	47.4-40.6	B	no	1979 1981	--	--	--
Merrimack River from Pawtucket Dam to Essex Dam, Lawrence	40.6-29.0	B	yes	1979 1981	Coliform bacteria Excessive algae	Combined sewer overflows and untreated discharges in Lowell.	Combined sewer overflows to be eliminated pending adequate funding. Untreated dry-weather flows to be tied in to Lowell (Duck Island) municipal WWTP by 1986.
Merrimack River from Essex Dam to Creek Brook, Haverhill	29.0-21.9	B	yes	1979 1981	Coliform bacteria Excessive algae	Upstream discharges. Combined sewer overflows in Lawrence.	Combined sewer overflows to be eliminated pending adequate funding.
Merrimack River from Creek Brook to Rocks Bridge, Haverhill-West Newbury	21.9-11.8	SB	yes	1979 1981	Coliform bacteria	Upstream discharges. Combined sewer overflows in Haverhill.	Combined sewer overflows to be eliminated pending adequate funding.

TABLE 17 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Merrimack River from Rocks Bridge to Routes 1 and 1A Bridge, Newburyport	11.8-3.0	SB	no	1979 1981	--	--	--
Merrimack River from Routes 1 and 1A Bridge to the Atlantic Ocean	3.0-0.0	SB	yes	1980 1981	Coliform bacteria	Untreated wastewater discharges in Salisbury. Newburyport primary WWTP.	Secondary WWTP for Salisbury in design phase. Newburyport WWTP upgrading to secondary treatment presently under construction.
Stony Brook, entire length	10.3-0.0	B	yes	1979	Coliform bacteria Excessive algae	Non-point. Urban runoff. Untreated wastewater discharges in Chelmsford.	Facilities planning underway in Chelmsford.
Beaver Brook, Massachusetts portion	4.2-0.0	B	yes	1979 1981	Coliform bacteria	Urban runoff. Untreated discharges in Lowell.	Tie in to Lowell (Duck Island) municipal WWTP by 1986.
Spicket River, entire Massachusetts portion	6.4-0.0	B	yes	1979 1981	Coliform bacteria Dissolved oxygen Phosphorus	Untreated discharges in Salem, N.H. and Lawrence. Industrial discharges.	Spicket River interceptor to tie in to Greater Lawrence WWTP. Time schedule pending wastewater management decisions for Salem, N.H.

TABLE 17 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Little River, Massachusetts portion	4.3-0.0	B	yes	1974	Dissolved oxygen Solids Coliform bacteria	Untreated discharges in Plaistow, N.H. and Haverhill. Combined sewer overflows in Haverhill.	Little River Interceptor and CSO facility plan in preparation for Haverhill.
Powwow River, Massachusetts portion	6.4-0.0	B/SB	yes	1979 1981	Coliform bacteria	Untreated municipal discharges in Amesbury center. Urban runoff.	Facilities plan for sewerage system expansion in preparation for Amesbury.
Black Rock Creek, entire length	1.7-0.0	SB	yes	1974 1980	Dissolved oxygen Coliform bacteria Solids	Untreated and partially treated municipal discharges in Salisbury.	Salisbury WWTP going to design phase pending review of facilities plan and Environmental Impact Report.

Total miles assessed (Merrimack River) - 49.8
Total miles meeting standards (Merrimack River) - 15.6
Total miles assessed (tributaries) - 33.3
Total miles meeting standards (tributaries) - 0.0

MILLERS RIVER BASIN

Description of the Watershed

The Millers River is formed in Winchendon by the confluence of the North and South Branches. The North Branch begins in New Ipswich, New Hampshire, while the South Branch begins in Ashburnham, Massachusetts. The main stem of the Millers River flows generally westward through Winchendon, Templeton, Royalston, Athol, Orange, Erving, and Montague, joining the Connecticut River just below the French King Bridge in Gill.

Major tributaries are the Otter River which enters in Winchendon, and the Tully River which enters in Athol. The Tully and Millers rivers are considered as potential sources of water supply.

The Millers River drains a total area of 390 square miles, of which about 350 are in Massachusetts. The population of the Massachusetts area was 57,000 in 1970. Average flow entering the Connecticut River from the Millers is 620 cubic feet-per-second.

The United States Army Corps of Engineers operates two flood control dams in the Millers Basin--Birch Hill Dam on the Millers River and Tully Dam on the Tully River. Other dams are located in Winchendon, Athol, Orange, and Millers Falls. The United States Geological Survey maintains seven flow gaging stations on the Millers River and its tributaries.

Water Quality Conditions and Trends

Sewage treatment plants are located in Winchedon, South Royalston, Athol, Orange, Erving and Millers Falls on the Millers River. The Gardner Sewage Treatment Plant, the Seaman Paper Company Wastewater Treatment Plant, and the Templeton Wastewater Treatment Plant discharge to the Otter River. The Fernald State School Sewage Treatment Plant discharges to Beaver Brook in Templeton.

The recently completed wastewater treatment plant in Erving provides a high degree of treatment of wastes from the Erving Paper Company. This has alleviated conditions in the lower reaches of the Millers River to a considerable extent.

The Templeton Wastewater Treatment Plant which treats paper wastes from Baldwinville Products and domestic wastes from the Village of Baldwinville went on line in May of 1979. This provides a high degree of treatment and has caused conditions in the Otter River to improve considerably. Although Class B criteria are still violated in the Otter and Millers rivers below this discharge, the change is still remarkable. The formerly mud colored

MILLERS RIVER BASIN

FIGURE 18

water is clear, floating solids are gone, and dissolved oxygen levels are much improved. It is hoped that further improvements will occur in the next few years as bottom deposits built up over the years are washed away.

Advanced waste treatment will be necessary at the Gardner Sewage Treatment Plant before there is any chance of the Otter River meeting Class B criteria. This is currently in the planning stages. The treatment plant at Seaman Paper Company is currently being upgraded to handle additional production at this paper mill. Treatment will be provided soon for domestic wastes from the Village of Farley in Erving.

Major improvements in the water quality of the Millers River Basin have occurred in the past few years. Although the water quality is not at Class B levels yet in most of the basin it is close. The elimination of coliform violations will allow most of the Millers to meet Class B standards. Although the Otter River has improved significantly, it still will be several years before it can be expected to meet Class B standards.

Lakes and Ponds

Inventory

Number of lakes and ponds	107
Surface area of lakes and ponds (acres)	4,435
Number of lakes and ponds greater than 10 acres	72
Surface area of lakes and ponds greater than 10 acres	4,251
Number of officially recognized Great Ponds	2
Surface area of officially recognized Great Ponds (acres)	74

Intensive Surveys

Lake	Location	Survey Period	Date of Report Publication
Lake Monomonac	Winchendon/ Rindge, N.H.	1976	November 1976
Lake Watatic	Ashburnham	1978-1979	*

*Data held in files at the Division's office in Westborough.

Classification

Lake	Location	Stratification	Severity Points
Bent's Pond	Gardner	U	11
Candlelight Pond	Templeton	U	6
Lake Dennison	Winchendon	U	8
Dunn's Pond	Gardner	U	7
Eagleville Pond (Lake Rohunta)	Athol/Orange/New Salem	S	10
Lake Ellis	Athol	U	9
Kendall Pond	Gardner	S	5
Laurel Lake	Erving	S	7
Lake Monomonac	Winchendon/Rindge, N.H.	U	7
Lower Naukeag Lake	Ashburnham	U	6
Moore's Pond	Warwick	U	4
North Spectacle Pond	New Salem	S	9
Orange Impoundment	Orange	U	14
Packard Pond	Orange	S	7
Partridgeville Pond	Templeton	U	6
Parker Pond	Gardner	U	7
Sportsman's Pond	Athol	U	10
South Athol Lake	Athol	U	8
South Spectacle Pond	New Salem	S	11
Sunset Lake	Ashburnham	S	12
Tully Pond	Orange	S	7
Ward Pond	Ashburnham	S	13
Lake Watatic	Ashburnham	U	11
Wheeler's Pond	Erving	U	7
White Pond	Athol	S	10
Whitney Pond	Weymouth	S	10

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TABLE 18

MILLERS RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Millers River							
Above Winchendon STP, Winchendon	above 35.7	B	yes	1979	Coliform bacteria	Winchendon CSO's.	Eliminate Winchendon CSO's.
Winchedon STP to Otter River	35.7-30.4	B	no	1979	--	--	--
Otter River to South Royalston USGS Gage	30.4-25.6	B	yes	1979 1980	Dissolved oxygen Nutrients	Gardner WWTP.	Advanced waste treatment at Gardner.
South Royalston USGS Gage to Tully River, Athol	25.6-19.1	B	no	1979	--	--	--
Tully River to Orange Center Dam, Orange	19.1-13.6	B	no	1979	--	--	--
Orange Center Dam to Erving Paper Company, Erving	13.6-8.1	B	no	1979	--	--	--
Erving Paper Company to Connecticut River, Erving	8.1-0.0	B	yes	1979 1980 1981	Solids	Erving WWTP.	Eliminate operational problems at Erving WWTP.
Otter River							
Above Gardner STP	above 9.7	B	yes	1979 1980	Dissolved oxygen	Due to natural causes in the swamps that form the headwaters.	--
Gardner STP to Seaman Paper, Templeton	9.7-5.3	B	yes	1979 1980	Dissolved oxygen Nutrients	Gardner discharge.	Advanced waste treatment at Gardner.

TABLE 18 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Seaman Paper to Templeton WWTP	5.3-3.9	B	yes	1979 1980	Dissolved oxygen Nutrients	Gardner discharge.	Advanced waste treatment at Gardner.
Templeton WWTP to Millers River, Winchendon	3.9-0.0	B	yes	1979 1980	Dissolved oxygen Nutrients	Gardner discharge.	Advanced waste treatment at Gardner.
Beaver Brook							
Fernald State School discharge in Templeton to Millers River, Royalston	3.1-0.0	B	no	1979	--	--	--

Total miles assessed (Millers River) - 35.7
Total miles meeting standards (Millers River) - 22.8

Total miles assessed (tributaries) - 12.8
Total miles meeting standards (tributaries) - 3.1

NASHUA RIVER BASIN

Description of the Watershed

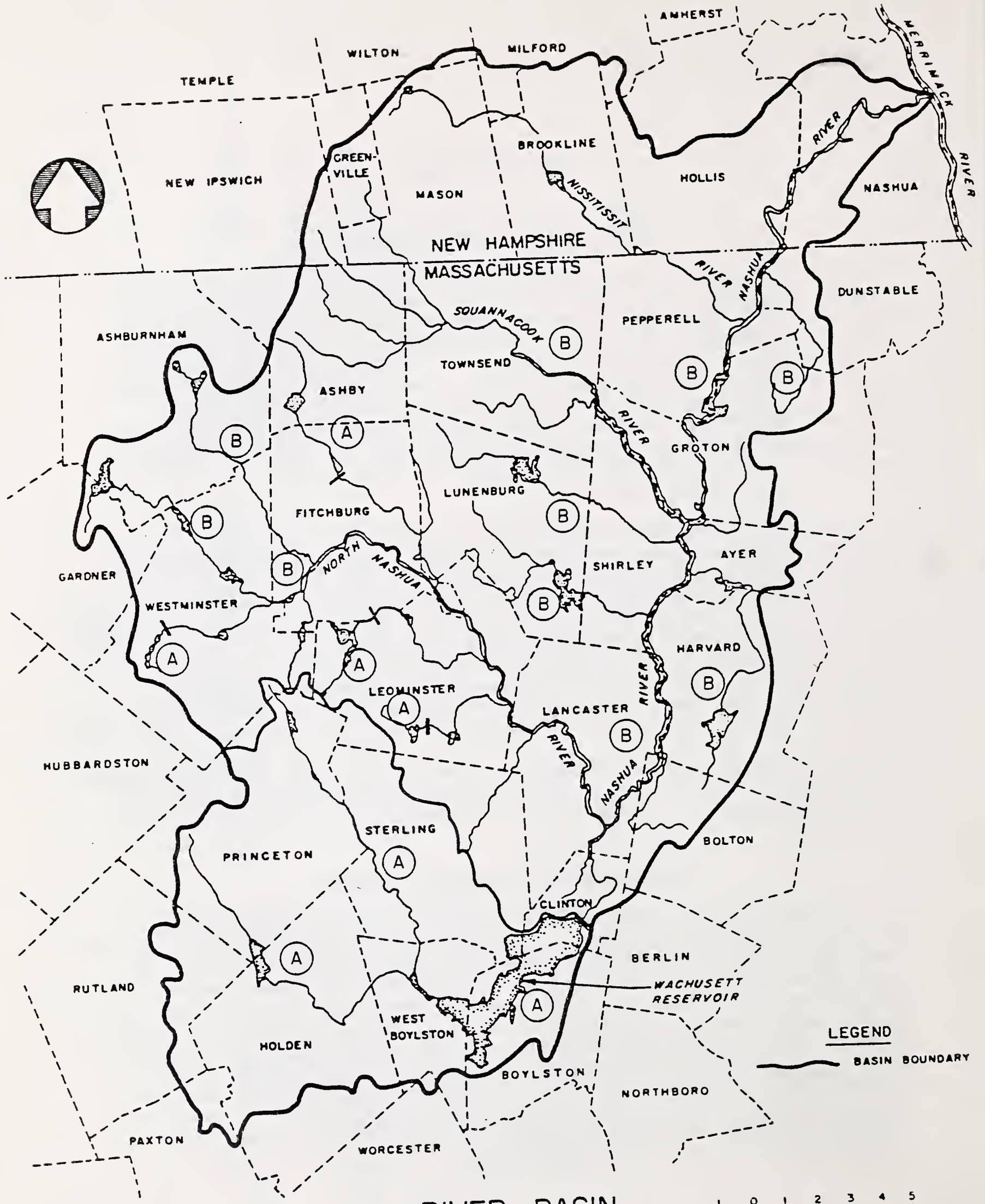
The Nashua River, located in north central Massachusetts and southern New Hampshire, consists of a north branch and a south branch which combine in Lancaster, Massachusetts to form the main stem. The river then flows in a northeasterly direction until it joins the Merrimack River in Nashua, New Hampshire. The river's 530 square mile drainage area lies primarily within Worcester and Middlesex counties in Massachusetts and includes the 115 square mile watershed of the Metropolitan District Commission's Wachusett Reservoir. However, only 12 million gallons of water per week are released to the south branch from this reservoir. As a result the Wachusett watershed has only minor importance with respect to the flow in the rest of the river basin.

From the headwaters of the north branch in Fitchburg to the confluence with the south branch, a distance of 19 miles, the river elevation drops 360 feet. The main stem then falls another 110 feet along its remaining 37 mile course to the Merrimack River. The United States Geological Survey maintains a single flow-gaging station on the main stem at East Pepperell. The flow at this station over the past forty years averaged 560 cubic feet-per-second (cfs). Gaging stations are located on the north branch of the Nashua River in Leominster and Fitchburg. The average flow at the Leominster gage over the same forty-year period was 193 cfs. The new gage at Fitchburg showed average yearly flows of from 96 to 141 cfs from 1975 to 1980.

All or a portion of 26 Massachusetts cities and towns lie within the Nashua River Basin. The two largest municipalities are Fitchburg and Leominster with populations of 41,718 and 36,030 respectively (1975).

Water Quality Conditions and Trends

During the 1960's and early 70's the Nashua River was probably the most polluted stream in Massachusetts. Untreated municipal and industrial wastewater discharges in Fitchburg, Leominster, Clinton and other population centers severely impacted water quality throughout the rivers length. In the 1960's the loadings of oxygen demanding wastes were so severe that dissolved oxygen concentrations often dropped to 0.0 mg/l along a stretch of five to ten miles of the main stem Nashua River. The Report on Pollution of the Merrimack River and Certain Tributaries (Part V - Nashua River) prepared by the Federal Water Pollution Control Administration describes the situation on July 1, 1966 when the entire main stem of the river was completely devoid of dissolved oxygen from Still River (just below the confluence of the north and south branches) to Hollis New Hampshire.



NASHUA RIVER BASIN

FIGURE 19

In the early 1970's over 30,000 pounds per day of BOD_5 were discharged to the Nashua River. Major sources included four paper manufacturing companies in Fitchburg with multiple untreated process waste discharges, as well as inadequately treated municipal wastewater from seriously overloaded treatment plants in Fitchburg, Leominster, Clinton, and Ayer. Other sources included treated paper manufacturing waste discharges in Pepperell and West Groton, combined sewer overflows in Fitchburg and Leominster, and non-point sources such as urban runoff.

The extreme water pollution problems exhibited in the Nashua River in the 1960's prevented any beneficial uses of the river. Citizens complained of foul odors, fish kills, large mats of floating paper sludge and general unaesthetic conditions.

In the early 1970's a program was initiated to abate water pollution in the Nashua River. Plans to eliminate untreated wastewater discharges, and upgrade outdated treatment facilities were formulated in response to both citizen demands, and environmental legislation such as the Federal Water Pollution Control Act (PL92-500). This legislation provided grants for the design and construction of municipal wastewater treatment facilities and the elimination of direct river discharges of untreated wastewater of domestic or industrial origin.

In 1975 two new wastewater treatment plants were completed in the city of Fitchburg. The Fitchburg Westerly WWTP was designed to process paper manufacturing wastes and small loadings of domestic wastewater. All of the paper companies that formerly discharged untreated process wastes to the north branch of the Nashua River now transport their wastes to the westerly facility for treatment. The Fitchburg Easterly WWTP treats sanitary wastewater from the city before discharging it to the north branch Nashua River. Both facilities provide better than secondary treatment although the westerly plant has exhibited many operational problems since it first went on line.

Sampling of wastewater discharges in 1977 revealed that BOD loadings to the Nashua River had been reduced to approximately 5,000-9,000 pounds per day. Water quality surveys of the river in 1977 indicated that improvements had been realized with the construction of the Fitchburg treatment facilities. Upgrading of the municipal treatment plants in Leominster, Clinton, and Ayer are scheduled and will further reduce the pollutant loadings to the Nashua River.

Water quality problems do still exist in the Nashua River. Ammonia-nitrogen and phosphorus concentrations resulting from secondary treatment facility discharges are high and promote the growth of algae and aquatic macrophytes during summer months in the lower main stem Nashua River. This is particularly evident in the Pepperell Pond impoundment.

Dissolved oxygen concentrations fluctuate a great deal along the north branch as BOD from upstream discharges is exerted and reaeration occurs at dams and rapids. A characteristic dissolved oxygen sag occurs at NM22 (Hospital Road) as final BOD exertion and nitrification take place. Water in

Pepperell Pond and the lower main stem becomes supersaturated with dissolved oxygen in the summer as the result of algal photosynthesis.

Combined sewer overflows and dry weather sewage loadings are major problems in the cities of Fitchburg and Leominster. To date, these loadings have not been adequately quantified, but significant amounts of BOD, solids, and nutrients are released to the North Nashua River as well as to Phillips Brook and other tributaries. High instream coliform bacteria levels are further evidence of the combined sewer problems in these two cities.

Non-point source pollution in the Nashua River Basin consists mainly of urban stormwater runoff but also includes agricultural runoff, leachate from landfills and dumps, and siltation and erosion problems.

Tributaries to the Nashua River which flow through urban areas such as the lower segments of Phillips Brook, Monoosnoc Brook, and Willow Brook are subject to combined sewer overflows and urban runoff and, therefore, exhibit higher BOD, solids, and coliform bacteria counts. Flag Brook receives leachate from the sanitary landfill on Ambrose Lane which promotes eutrophication in Sawmill Pond. Tributaries which flow through rural, undeveloped regions generally contain clean water. These include the Whitman, Still, Squannacook, and Nissitissit rivers as well as many smaller streams.

Lakes and Ponds

Inventory

Number of lakes and ponds	161
Surface area of lakes and ponds (acres)	10,933
Number of lakes and ponds greater than 10 acres	94
Surface area of lakes and ponds greater than 10 acres	10,631
Number of officially recognized Great Ponds	10
Surface area of officially recognized Great Ponds (acres)	1,094

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Eagle Lake	Holden	1979-1980	September 1981
East Lake Waushacum	Sterling	1980-1981	*
Wyman Pond	Westminster	1980-1981	*

* Report in progress

Classification

Lake	Location	Stratification	Severity Points
Baddacook Pond	Groton	S	7
Bare Hill Pond	Harvard	S	10
Bower Springs Conservation Area	Bolton	U	8
Chapin Pond	Holden	U	5
Cow Pond	Groton	S	7
Eagle Lake	Holden	U	6
East Lake Waushacum	Sterling	S	4
Flannagan (Fletcher) Pond	Ayer	U	13
Fort Pond	Lancaster	S	9
Green's Pond	Fitchburg	U	11
McTaggart's Pond	Fitchburg	U	7
Mirror Lake	Fitchburg	U	7
Mossy Pond	Clinton	S	8
Partidge Pond	Westminster	U	9
Pepperell Pond	Pepperell	U	15
Putnam Pond	Fitchburg	U	10
Rockwell Pond	Leominster	U	8
Sandy Pond	Ayer	S	6
Sawmill Pond	Fitchburg	U	14
Lake Shirley	Lunenburg/Shirley	S	11
Snow's Mill Pond	Fitchburg	U	6
Spectacle Pond	Lancaster	S	4
South Meadow Pond (East)	Clinton	S	9
South Meadow Pond (West)	Clinton/Lancaster	U	9
Wattles Pond	Groton	S	10
Whalom Pond	Leominster/Lunenburg	S	6
White Pond	Lancaster	U	7
Winnekeag Lake	Ashburnham	S	10
Wyman Pond	Westminster	S	12

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TABLE 19

NASHUA RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Main stem Nashua River from the confluence of the north and south branches to the Ice House Dam, Ayer	36.5-26.1	B	yes	1977 1981	Dissolved oxygen	Upstream discharges in Leominster and Clinton. Urban runoff from Fort Devens.	Reconstructed WWTP at Leominster to commence operation in May, 1984. Upgrading of MDC-Clinton WWTP in Step II design phase.
Main stem Nashua River from Ice House Dam to Mass.- N.H. state line, Pepperell-Hollis, N.H.	26.1-10.5	B	yes	1977 1981	Coliform bacteria Excessive algae	Urban runoff. Ayer WWTP. Upstream discharges.	Ayer WWTP upgrading to be completed by the fall of 1982.
North branch Nashua River from Fitchburg West WWTP to Daniel St., Fitchburg	56.1-54.0	B	yes	1977 1981	Dissolved oxygen	Fitchburg West WWTP.	Facilities plan in preparation to address operational problems of Fitchburg West WWTP.
North branch Nashua River from Daniel St. to Fitchburg East WWTP	54.0-48.5	B	yes	1977 1981	Dissolved oxygen Coliform bacteria	Fitchburg West WWTP. Combined sewer overflows.	Facilities planning for CSO management pending due to local funding decisions.
North branch Nashua River from Fitchburg East WWTP to Leominster WWTP	48.5-46.4	B	yes	1977 1981	Coliform bacteria	Combined sewer overlows. Urban runoff.	
North branch Nashua River from Leominster WWTP to confluence with south branch, Lancaster	46.4-36.5	B	yes	1977 1981	Dissolved oxygen	Leominster secondary WWTP.	Leominster WWTP upgrading to advanced secondary is scheduled for May, 1984 completion.

TABLE 19 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
South branch Nashua River from outlet of Lancaster millpond to the MDC-Clinton WWTP, Clinton	4.6-1.6	B	yes	1977	Coliform bacteria	Urban runoff.	Best management practices recommended in MRPC 208 report.
South branch Nashua River from MDC-Clinton WWTP to confluence with north branch, Lancaster	1.6-0.0	B	yes	1977 1981	Dissolved oxygen Plant nutrients	MDC-Clinton secondary WWTP.	MDC-Clinton WWTP is in design phase for conversion to advanced secondary treatment.
Flag Brook from outlet of Crocker Pond to confluence with the Whitman River, Fitchburg	2.7-0.0	B	yes	1980 1981	Dissolved oxygen Suspended solids Aesthetics	Fitchburg landfill leachate.	Refine treatment.
Whitman River, entire length	6.7-0.0	B	yes	1977	Coliform bacteria	Non-point sources. Untreated municipal discharges in South Ashburnham.	Facilities planning underway for collection and treatment of sewage in problem areas throughout Ashburnham.
Phillips Brook, entire length	8.0-0.0	B	yes	1977 1981	Coliform bacteria	Non-point sources. Combined sewer overflows in Fitchburg.	Facilities planning for CSO management pending due to local funding constraints.
Monoosnoc Brook, downtown Leominster segment only	1.5-0.0	B	yes	1977 1981	Coliform bacteria. BOD	Combined sewer overflows in Leominster. Urban runoff.	Sewerage system rehabilitation projects ongoing in Leominster.

TABLE 19 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Fall Brook, entire length	3.0-0.0	B	yes	1977 1981	Coliform bacteria	Combined sewer overflows in Leominster. Urban runoff.	Sewerage system rehabilitation.
Still River, entire length	3.1-0.0	B	yes	1977 1981	Dissolved oxygen Coliform bacteria	Natural sluggish flow. Lancaster School for Girls sand filters are suspect.	Further survey work needed, to determine necessary abatement.
Catacoonamug Brook, entire length	2.0-0.0	B	no	1981	--	--	--
Nonacoicus Brook, entire length	1.5-0.0	B	no	1977 1981	--	--	--
Squannacook River from its origin in Townsend to Hollingsworth & Vose, Inc., West Groton	14.3-3.6	B	yes	1977	Coliform bacteria	Septic system failures in Townsend.	Nonstructural wastewater management alternatives as outlined in MRPC 208 report.
Squannacook River from Hollingsworth & Vose, Inc. to confluence with Nashua River, Groton-Shirley	3.6-0.0	B	yes	1977 1981	Coliform bacteria	Runoff in West Groton.	--

TABLE 19 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
James Brook, entire length	4.4-0.0	B	yes	1977 1981	Coliform bacteria. Excessive algae.	Non-point sources. Septic system failures suspected.	Facilities planning underway for town of Groton.
Nissitissit River, Massachusetts segment	4.5-0.0	B	no	1977 1981	--	--	--

Total miles assessed (Nashua River) - 50.2
Total miles meeting standards (Nashua River) - 0.0

Total miles assessed (tributaries) - 55.3
Total miles meeting standards (tributaries) - 8.0

NORTH COASTAL DRAINAGE AREA

Description of the Watershed

The North Coastal drainage area extends from the Essex River to Boston Harbor. The thirteen cities and towns in the area range from highly urbanized Lynn, Salem, and Beverly to rural Manchester and Essex. The total drainage area is 137.9 square miles.

The major rivers are the Essex River in Essex, the Annisquam River in Gloucester, Danvers River in Danvers, and the Saugus and Pines Rivers in Saugus. Important harbors and bays are located in Essex, Rockport, Gloucester, Manchester, Beverly, Salem, Marblehead, Nahant, and Lynn.

Towns with shoreline include: Essex, Gloucester, Rockport, Manchester, Beverly, Danvers, Salem, Marblehead, Swampscott, Lynn, Nahant, Saugust, Revere and Winthrop.

The Massachusetts Ocean Sanctuary Act (M.G.L. Chapter 132A, § 13-18, and as appended in Chapter 822) protects Essex Bay, Rockport Harbor, Gloucester Harbor, Beverly Harbor, Salem Harbor, Marblehead Harbor, and other marine waters designated by the Act. The Act prohibits, for example, construction in and discharges to the ocean.

Water Quality Conditions and Trends

Water quality data for the estuarine and marine waters of the North Shore are somewhat deficient. Sampling completed by the Division in 1976 concentrated on the inland streams, where there are no significant industrial or municipal discharges.

Water quality problems are suspected near the untreated discharges of Gloucester and Lynn. Those problems would include coliform violations and aesthetics. The South Essex Sewerage District WWTP, a primary treatment plant, discharged the sludge generated to the ocean because it is too high in chromium to be incinerated. The suspected problems in Salem Beverly Harbor are similar to those in Lynn and Gloucester Harbors. Combined sewer overflows in Beverly probably cause coliform violations in the inner harbor.

Fish processing in Gloucester Harbor causes known oil and grease and aesthetics violations. The General Electric Company in Lynn discharges cooling water to the Saugus River; the impact of this discharge is as yet undetermined.

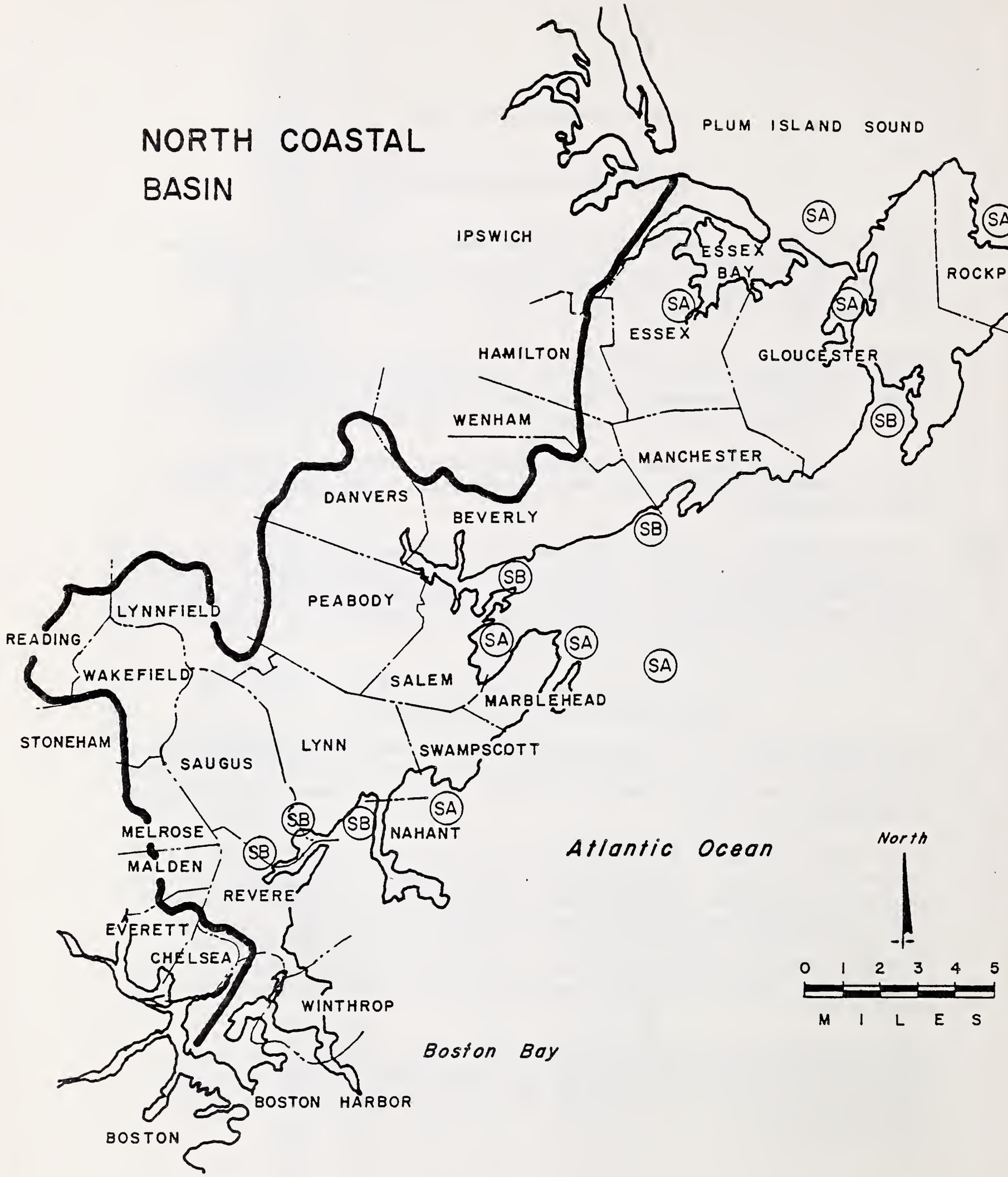
NORTH COASTAL BASIN
PLUM ISLAND SOUND
IPSWICH
ESSEX BAY
ROCKPORT
ESSEX
HAMILTON
GLOUCESTER
WENHAM
MANCHESTER
DANVERS
BEVERLY
PEABODY
LYNNFIELD
READING
WAKEFIELD
SALEM
MARBLEHEAD
STONEHAM
SAUGUS
LYNN
SWAMPSCOTT
MELROSE
NAHANT
MALDEN
REVERE
EVERETT
CHELSEA
WINTHROP
Atlantic Ocean
Boston Bay
BOSTON HARBOR
BOSTON
SA
SB
North
0 1 2 3 4 5
M I L E S

FIGURE 20

A number of the communities will be applying/applied for a 301(h) waiver of secondary treatment for ocean outfalls. The waiver requires primary treatment and extended outfalls.

The towns of Rockport and Manchester recently completed secondary treatment plants, while Swampscott has a primary treatment plant.

Lakes and Ponds*

Inventory

Number of lakes and ponds	85
Surface area of lakes and ponds (acres)	2,403
Number of lakes and ponds greater than 10 acres	39
Surface area of lakes and ponds greater than 10 acres	2,152
Number of officially recognized Great Ponds	8
Surface area of officially recognized Great Ponds (acres)	718

Classification

Lake	Location	Strafification	Severity Points
Babson Farm Quarry	Rockport	S	10
Chebacco Lake	Hamilton/Essex	S	10
Ell Pond	Melrose	S	10
Pillings Pond	Lynnfield	U	13
Sluice Pond	Lynn	S	10

References

Massachusetts coastal zone management program and final environmental impact statement. 1978. Boston, Massachusetts. 439 pp.

Massachusetts Department of Environmental Quality Engineering. 1980. Report on the Annisquam River in Gloucester: Shellfish Sanitation Program. Woburn, Massachusetts. 28 pp.

Massachusetts Department of Public Health. 1965. Special report: waters of Manchester - Beverly - Salem - Lynn - Marblehead. Boston, Massachusetts. 32 pp.

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the North Coastal Basin.

Massachusetts Division of Water Pollution Control. 1977. North Coastal: 1976: part a - water quality data; part b - wastewater discharge data. Westborough, Massachusetts. 53 pp.

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_____. 1977. Water quality monitoring program of the Metropolitan Area Planning Council. 208 management area: 1977 data report. Westborough, Massachusetts. 226 pp.

Metropolitan Area Planning Council. 1978. Areawide waste treatment management plan for the metropolitan Boston area. Boston, Massachusetts. 3 vol.

_____. 1977. North Coastal Basin preliminary report. Boston, Massachusetts. 261 pp.

TABLE 20

NORTH COASTAL BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Rivers							
Essex River from source to mouth	4.9	SA	yes	1976	Coliform bacteria	unknown	--
Annisquam River from source to mouth	3.6	SA	no	1979	--	--	--
Danvers River from source to mouth	1.9	SB	no	1976	--	--	--
Saugus River from source to mouth	8.6	SB	yes	1976 1978	Coliform bacteria	unknown	--
Pines River from source to mouth	6.4	SB	yes	1976	Coliform bacteria	unknown	--
North River from source to mouth	3.1	SB	yes	1976	Coliform bacteria	unknown	--
Total miles assessed - 28.5 Total miles meeting standards - 5.5							
Harbors and Bays							
Essex Bay	--	SA	unknown	--	--	--	--
Rockport Harbors	--	SB	unknown	--	--	--	--
Gloucester Harbor	--	SB	yes	1979 1980	Coliform bacteria Oil & grease Aesthetics	Untreated discharges.	Tie-in and upgrade treatment facility.
Manchester Harbor	--		unknown	--	--	--	--
Beverly Harbor	--	SB	no	1976	--	--	--

TABLE 20 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Salem Harbor	--	SB	no	1976	--	--	--
Marblehead Harbor	--	SA	no	1976	--	--	--
Lynn Harbor	--	SB	no	1973 1976	--	--	--
Nahant Bay	--	SA	no	1973	--	--	--
Coastline							
Essex	--	SB	unknown	none			
Gloucester	--	SB	unknown	1979	Possible coliform bacteria	Untreated discharges	Tie-in sewerage system
Rockport	--	SB	unknown	none	--	--	--
Manchester	--	SB	unknown	none	--	--	--
Beverly	--	SB	unknown	1965	--	--	--
Salem	--	SB	unknown	1965	--	--	--
Marblehead	--	SA	no	1965 1977	--	--	--
Nahant	--	SB	unknown	1965	--	--	--
Lynn	--	SB	unknown	1965	--	--	--
Revere	--	SB	unknown	1965	--	--	--
Winthrop	--	SA	unknown	1965	--	--	--
Swampscott	--	SB	unknown	1965	--	--	--

NORTH RIVER BASIN

Description of the Watershed

The North River is essentially two rivers. The portion above Curtis Crossing Dam in Hanover is a freshwater stream with French Stream, Drinkwater River, and Indian Head River being considered as the mainstem. Below Curtis Crossing, the North River is saline and subject to tidal influence. The main stem rivers flow easterly approximately 21 miles through Weymouth, Rockland, Abington, Hanover, Hanson, Pembroke, Norwell, Scituate and Marshfield discharging to Massachusetts Bay.

Major tributaries are the South River, which enters in Marshfield, Third Herring Brook which enters at the Norwell-Hanover town line and the upper Drinkwater River which enters in Hanover. Factory Pond and Forge Pond are the two major impoundments on the main stem. Major ponds in the basin include Oldham Pond, Indian Head Pond and Great Sandy Bottom Pond.

The North River Basin drains a total area of 105.4 square miles. The United States Geological Survey (U.S.G.S.) operates a gaging station at Curtis Crossing which drains 30.3 square miles. Over the last 14 years the gage has recorded an average flow of 62.5 cubic feet per second (cfs) with maximum and minimum flows of 1,390 cfs and 0.14 cfs, respectively.

Water Quality Conditions and Trends

For many years domestic and industrial wastewater in Weymouth, Abington, Rockland, and Scituate have subjected the North River, in particular, the freshwater portion upstream of Curtis Crossing to high loadings of oxygen-demanding and nutrient-laden pollutants.

In the early 1970's the French Stream was severely polluted due to discharges from the Naval Air Station in Weymouth, Plymouth Rogers Division-Colonial Provision Company and North Abington WWTP in Abington, and Clark-Babbitt Foods and Rockland WWTP in Rockland. Since that time many of these sources have been eliminated. Today only the discharges at the North Abington WWTP and Rockland WWTP remain.

Water quality upstream of Curtis Crossing (freshwater portion) is presently not meeting its assigned B classification. Dissolved oxygen levels remain low while solids and nutrients remain high due to the North Abington and Rockland WWTP's. For this reason the Rockland WWTP is currently being upgraded to an advanced wastewater treatment plant and will include flows from the North Abington WWTP. The Rockland plant is scheduled to be completed during the summer of 1982 and will have a major impact on the water quality of the North River.

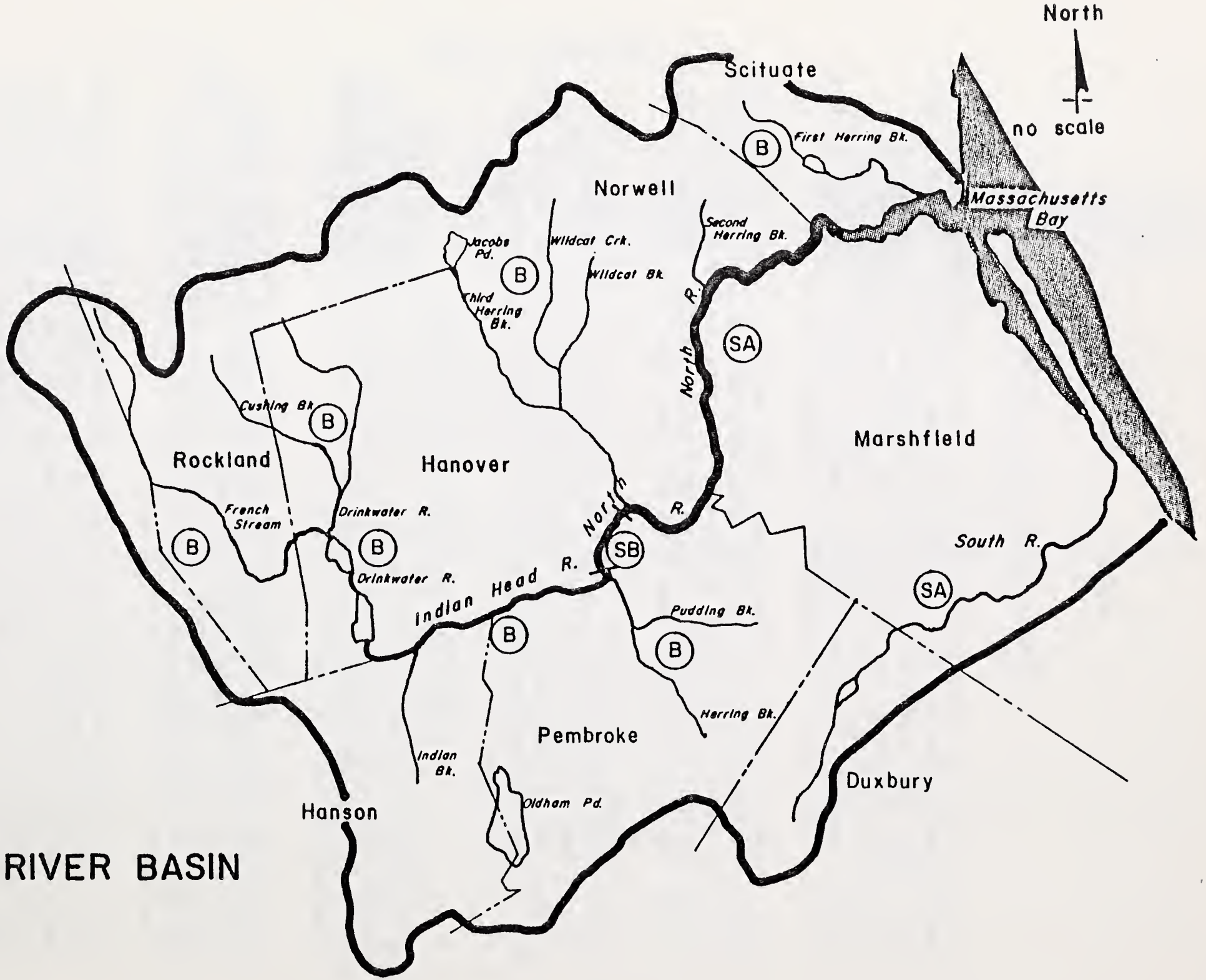

North
no scale
Scituate
First Herring Bk.
Norwell
Massachusetts Bay
Second Herring Bk.
Jacobs Pd.
Wildcat Crk.
Wildcat Bk.
Third Herring Bk.
North R.
SA
Cushing Bk
B
Rockland
Hanover
Marshfield
French Stream
Drinkwater R.
Drinkwater R.
North R.
SB
South R.
Indian Head R.
Pudding Bk.
Herring Bk.
Pembroke
Indian Bk.
Oldham Pd.
Hanson
Duxbury
NORTH RIVER BASIN

FIGURE 21

Lakes and Ponds*

Inventory

Number of lakes and ponds	57
Surface area of lakes and ponds (in acres)	1,557
Number of lakes and ponds greater than 10 acres	30
Surface area of lakes and ponds greater than 10 acres	1,417
Number of officially recognized Great Ponds	7
Surface area of officially recognized Great Ponds (in acres)	749

Classification

Lake	Location	Stratification	Severity Points
Factory Pond	Hanover/Hanson	U	12
Forge Pond	Hanover	U	16
Jacobs Pond	Norwell	U	8
Maquan Pond	Hanson	U	4
Oldham Pond	Pembroke	U	6

References

Massachusetts Division of Water Pollution Control. 1971. Data Record on Water Quality, North River 1971. Boston, Massachusetts. 61 pp.

_____. 1975. The North River Water Quality Survey Data. Westborough, Massachusetts. 90 pp.

_____. 1975. The North River Planning Area Water Quality Management Plan. Westborough, Massachusetts. 69 pp.

_____. 1977. The North River Basin, French Stream, Water Quality Data, Wastewater Discharge Data. Westborough, Massachusetts. 53 pp.

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the North River Basin.

TABLE 21

NORTH RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Weymouth Naval Air Station to North Abington WWTP, North Abington	23.2-19.5	B	no	1977	--	--	--
North Abington WWTP to Rockland WWTP, Rockland	19.5-17.0	B	yes	1975 1977	Coliform bacteria Oxygen depletion Nutrients	North Abington WWTP.	North Abington WWTP tie-in to Rockland WWTP.
Rockland WWTP to Drinkwater River, Hanover	17.0-16.0	B	yes	1971 1975 1977	Oxygen depletion Coliform bacteria Nutrients Solids	Rockland WWTP. Wetlands.	Advanced wastewater treatment at Rockland WWTP to be completed during the summer of 1982.
Drinkwater River to outlet of Forge Pond, Hanover	16.0-15.3	B	yes	1971 1975 1977	Oxygen depletion Coliform bacteria Nutrients	Rockland WWTP.	Advanced wastewater treatment at Rockland WWTP.
Outlet of Forge Pond to inlet of Factory Pond, Hanover	15.3-14.5	B	yes	1971 1975	Oxygen depletion	Rockland WWTP.	Advanced wastewater treatment at Rockland WWTP.
Inlet to outlet of Factory Pond, Hanover	14.5-14.0	B	yes	1975 1971	Oxygen depletion	Rockland WWTP.	Advanced wastewater treatment at Rockland WWTP.
Outlet of Factory Pond to Indian Head Brook, Hanover-Hanson	14.0-13.2	B	yes	1975 1971	Oxygen depletion	Rockland WWTP. Wetlands.	Advanced wastewater treatment at Rockland WWTP.

TABLE 21 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Indian Head Brook to Curtis Crossing Dam, Hanover-Pembroke	13.2-11.6	B	yes	1971 1975	Oxygen depletion Coliform bacteria	Residual from upstream segments. Wetlands. Non-point sources.	Advanced wastewater treatment at Rockland WWTP.
Curtis Crossing Dam to Third Herring Brook, Hanover-Norwell	11.6-9.9	SB	no	1971 1975	Occasional coliform bacteria	Runoff and wetlands.	--
Third Herring Brook to Massachusetts Bay	9.9-0.0	SA	no	1971 1975	Occasional coliform bacteria	Runoff and wetlands.	--
South River entire length	10.6-0.0	SA	no	1971 1975	Coliform bacteria Nutrients	Non-point sources (septic systems) and wetlands.	

Total miles assessed (North River) - 23.2
Total miles meeting standards (North River) - 15.3

Total miles assessed (South River) - 10.6
Total miles meeting standards (South River) - 10.6

PARKER RIVER BASIN

Description of the Watershed

The Parker River Basin lies between the drainage basins of the Ipswich and Merrimack rivers in northeastern Massachusetts. All or part of nine communities lie within the 60 square mile area drained by the Parker River. The basin is generally rural-residential in nature, with only minor industrial development.

The Parker River rises at the confluence of two unnamed brooks in a wetland area in West Boxford. The river flows generally in a northeasterly direction through several small ponds and extensive wetland areas in the towns of Boxford, Georgetown, Groveland, and Newbury. In Newbury, the Parker River becomes tidal, with the last nine miles of the river subject to the rise of the tide. The Parker River flows through extensive coastal wetlands to its mouth where it empties into Plum Island Sound.

The Parker River is 23 miles long, drains 60 square miles, and has an average discharge into Plum Island Sound of 97.2 cfs. From its source to its mouth, the Parker River falls a total of 95 feet, of which 36 feet are taken up by the six dams located on the river.

The major topographic features of the Parker River Basin are low, rounded hills, freshwater wetlands, saltwater marshes and several small lakes and ponds which have formed in depressions in wetland areas. The surficial geology of the Parker River Basin was determined by the passage of one or more ice sheets during the Pleistocene Epoch and by the formation of alluvium and swamp deposits.

Water Quality Conditions and Trends

The freshwater portion of the Parker River flows through extensive wetland areas and is impounded in two locations by man-made dams. The wetland conditions, accompanied with low stream conditions, produce naturally occurring low dissolved oxygen levels. In addition, as the river flows through several rural towns, it is subject to runoff and septic tank leachate. Neither of these water quality impacts are considered serious and hence, the river meets its assigned classification.

The estuarine portion of the Parker River is a magnificent natural resource and is protected under the Wild and Scenic Rivers Act. Analysis of this portion of the river has surprisingly shown moderate dissolved oxygen and bacterial standards violations. It is projected that the causes are natural, probably the saltwater marsh influence and thus, this portion is listed as meeting its classification.

PARKER RIVER BASIN

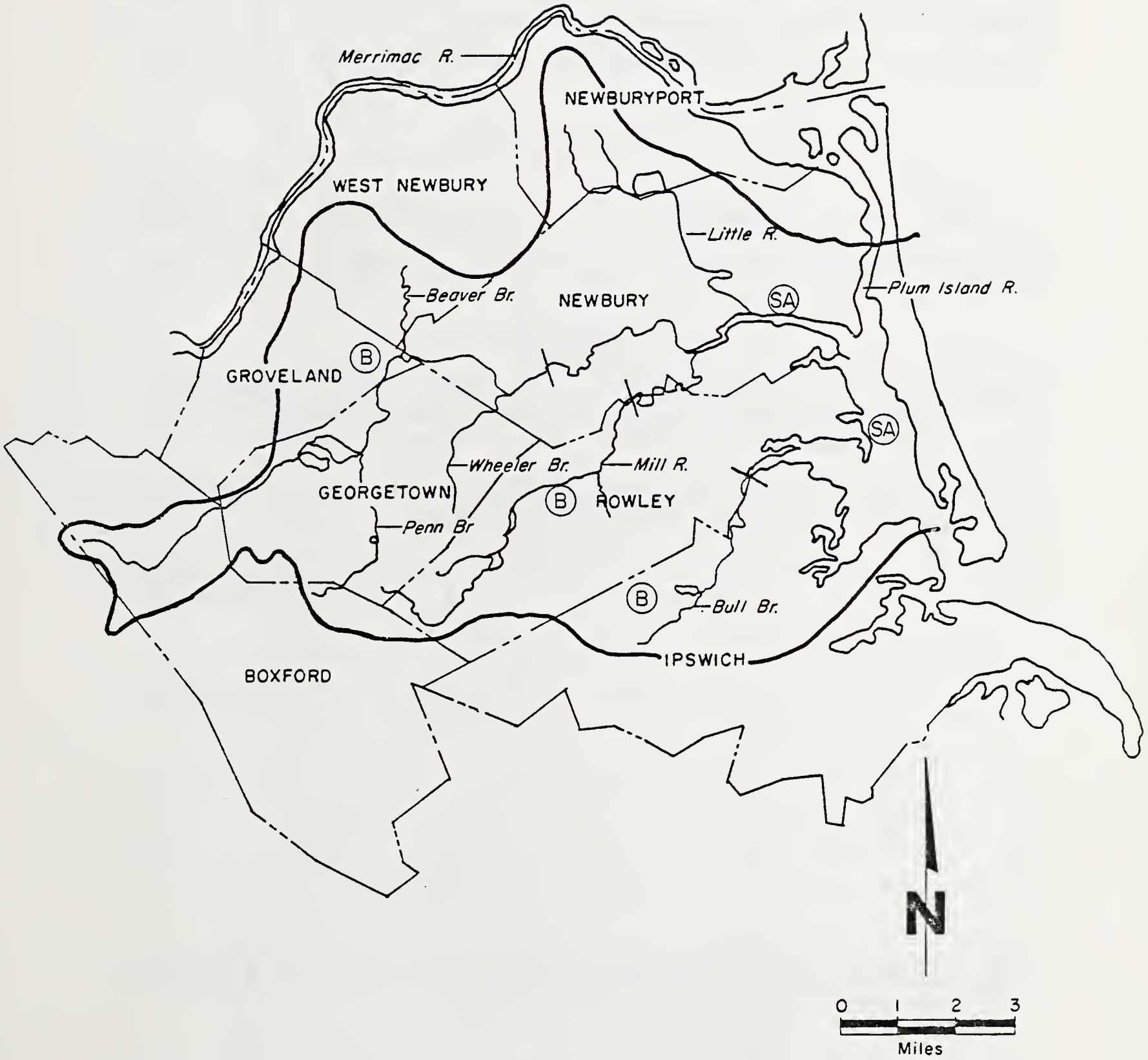


FIGURE 22

Lakes and Ponds*

Inventory

Number of lakes and ponds	18
Surface area of lakes and ponds (acres)	343
Number of lakes and ponds greater than 10 acres	10
Surface area of lakes and ponds greater than 10 acres	300
Number of officially recognized Great Ponds	4
Surface area of officially recognized Great Ponds (acres)	209

Classification

Lake	Location	Stratification	Severity Points
Baldpate Pond	Boxford	S	10

References

Massachusetts Division of Water Pollution Control. 1977. The Ipswich and Parker Rivers 1976 Part D - Water Quality Management Plan. Westborough, Massachusetts. 196 pp. (with appendices).

_____. 1979. Ipswich and Parker River Basins 1978 Water Quality Survey Data. Westborough, Massachusetts. 93 pp.

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Parker River Basin.

TABLE 22

PARKER RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Parker River, from its source in Boxford to Central Street, Newbury	22.0-9.0	B	no	1975 1978	Dissolved oxygen Coliform bacteria	Natural conditions.	None
Parker River from Central Street, Newbury to its mouth at Plum Island Sound	9.0-0.0	SB	no	1975 1978	Dissolved oxygen Coliform bacteria	Natural conditions.	None

Total miles assessed - 22.0
Total miles meeting standards - 22.0

SHAWSHEEN RIVER BASIN

Description of the Watershed

The Shawsheen River originates near Hanscom Air Force Base in Bedford and flows generally northeast through Billerica, Tewksbury, and Andover where it enters the Merrimack River in south Lawrence. In its 25 mile length, the Shawsheen drains an area of approximately 77 square miles and falls 70 feet. Dams create two impoundments along its entire length. The main stem is fed by numerous small brooks and streams along its path to the Merrimack River. For nearly half its length, the Shawsheen meanders through marshy wetland areas.

The only United States Geological Survey gaging station on the Shawsheen is located at the Billerica-Wilmington town line on Route 129, near the old Middlesex Canal. The drainage area at this point is 35.1 square miles. The average discharge since the gage was constructed in 1964 has been 50.9 cubic feet per second (cfs). The maximum discharge recorded was 1,050 cfs on March 19, 1968, and the minimum discharge recorded was 1.2 cfs on August 30, 1966.

Water Quality Conditions and Trends

The Shawsheen River generally meets Class B standards for water quality. Elevated nutrient levels from non-point sources contribute to increased phytoplankton counts and subsequent diurnal dissolved oxygen fluctuations. Furthermore, much of this stream flows sluggishly through wetlands and freshwater marshes which are highly productive. Natural dissolved oxygen depletion and increased nutrient content are associated with these wetland areas. Coliform bacteria counts are high in Andover and south Lawrence due to small wastewater discharges and urban runoff.

Lakes and Ponds

Inventory

Number of lakes and ponds	18
Surface area of lakes and ponds (in acres)	417
Number of lakes and ponds greater than 10 acres	9
Surface area of lakes and ponds greater than 10 acres	371
Number of officially recognized Great Ponds	4
Surface area of officially recognized Great Ponds (in acres)	187

SHAWSHEEN RIVER BASIN

FIGURE 23

Lake	Location	Classification: Stratification	Severity Points
Ames Pond	Tewksbury	U	7
Fosters Pond	Andover/Wilmington	S	12

References

Massachusetts Division of Water Pollution Control. 1975. Shawsheen River 1974 Water Quality Survey Data. Westborough, Massachusetts. 59 pp.

_____. 1977. 1974 Baseline Water Quality Studies of Selected Ponds in the Stony Brook and Shawsheen River Basins. Westborough, Massachusetts. 73 pp.

_____. 1980. The Merrimack River Basin 1979 Water Quality Survey Data, Wastewater Discharge Data, Non-point Source Sampling Data. Westborough, Massachusetts. 125 pp.

Screpetis, A.J. 1975. The Shawsheen River Water Quality Analysis and Basin Plan. Massachusetts Division of Water Pollution Control, Westborough, Massachusetts. 89 pp (with appendices).

TABLE 23

SHAWSHEEN RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Shawsheen River from Maguire Road to Spring Brook, Bedford.	25.0-23.3	B	yes	1979	Coliform bacteria	Urban runoff.	Initiate stormwater management practices in the town of Bedford as recommended in the MAPC 208 report.
Shawsheen River from Spring Brook to Horn Bridge, Andover.	23.3-5.9	B	no	1979	--	--	--
Shawsheen River from Horn Bridge to confluence with Merrimack River, Lawrence.	5.9-0.0	B	yes	1979 1981	Coliform bacteria	Urban runoff.	Initate stormwater management techniques in Andover and Lawrence as outlined in MVPC 208 report.

Total miles assessed - 25.0
Total miles meeting standards - 17.4

SOUTH COASTAL BASIN

Description of the Watershed

The South Coastal drainage area is located southeast of the metropolitan Boston area and includes all or part of the towns of Cohasset, Scituate, Marshfield, Duxbury, Kingston, Plymouth, and Plympton. Only the water systems within these towns which drain to Cape Cod Bay comprise the South Coastal drainage area. Bordering drainage areas include the Weymouth, North, and Taunton River basins and the Buzzards Bay drainage area.

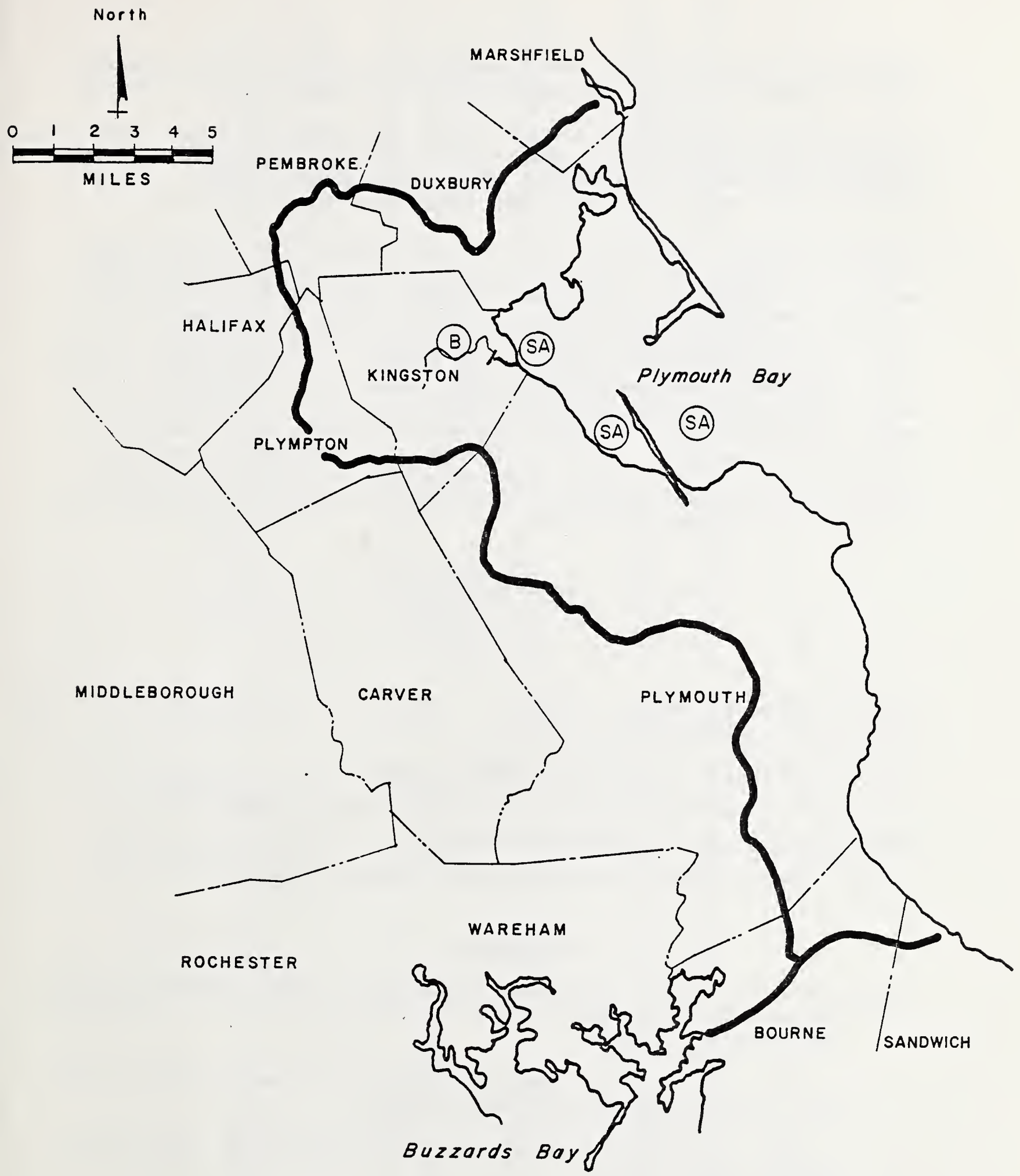
The Jones River Basin is the major river basin in the South Coastal drainage area. The Jones River originates at the outlet of Silver Lake in Kingston and flows in a east-southeasterly direction for approximately seven miles to Plymouth Bay. In addition to the Jones River, several other small streams, including the Eel, Bluefish, Duck Hill, and South rivers and Beaver Dam, Indian, and Town brooks discharge to Cape Cod Bay. As is characteristic of most coastal streams, only minimal elevation changes occur as these streams meander their way to the Atlantic Ocean.

All of the surface waterbodies in the drainage area are maintained largely through the discharge of groundwater from underlying aquifers. This is particularly true during the dry summer months. The delicate balance between demands for subsurface drinking water supplies and surface water quantity and quality is a primary planning concern in the South Coastal drainage area.

Water Quality Conditions and Trends

The surface waters of the South Coastal drainage area are generally good in terms of water quality. Problem areas where existing water quality is degraded by domestic and industrial pollution do exist but are isolated situations. Existing problems are largely related to (1) failing septic systems, (2) malfunctioning or overloaded wastewater treatment plants, and (3) untreated or inadequately treated industrial wastewater discharges. As an example, a combination of failing septic systems and an industrial discharge in the town of Kingston formerly prevented the lower portion of the Jones River from meeting Class SA water quality. In 1981 the industrial discharge to the Jones River was eliminated and as a result the lower Jones River is expected to meet its assigned Class SA classification. However, field data collected shortly following the discharge elimination indicate that violations have been greatly reduced, but residual effects still cause occasional problems. The situation should improve with time.

The Plymouth Wastewater Treatment Plant is subject to overloading due to inflow/infiltration (I/I) problems within the collection system. This



SOUTH COASTAL BASIN

FIGURE 24

problem is related to the extremely high groundwater level in the Plymouth area. Corrective measures are currently being evaluated by town officials.

Failing septic systems are known problems in the town of Cohasset. The municipal wastewater treatment plant also fails to provide adequate sewage treatment and should be upgraded to provide secondary treatment. The town has completed a Step 1 Facilities Plan which addresses this problem.

The South Coastal drainage area as a whole is subjected to seasonal water quality degradation as a result of increased population during the summer months. The number of failing septic systems increases seasonally due to increased use, improper maintenance, and fluctuations in groundwater levels. Another problem plaguing the coastal communities is the discharge of wastes from marine vessels moored in the harbors. As noted, these problems are accentuated in the summer months with a large influx of seasonal residents, vacationers, and tourists. However, a long term effect on the water quality of the surface waters and groundwater will most likely become a problem as the demand for drinking water supplies increases as the population continues to climb. The delicate balance between groundwater withdrawal and groundwater discharge to surface water bodies must be maintained to insure the high quality of both.

Lakes and Ponds*

Inventory

Number of lakes and ponds	116
Surface area of lakes and ponds (acres)	3,402
Number of lakes and ponds greater than 10 acres	56
Surface area of lakes and ponds greater than 10 acres (acres)	3,097
Number of officially recognized Great Ponds	7
Surface area of officially recognized Great Ponds (acres)	862

References

Massachusetts Division of Water Pollution Control. 1972. The South Coastal Drainage Basin, the Jones River 1981 Water Quality Data. Westborough, Massachusetts. 27 pp.

_____. 1977. South Coastal Water Quality Data, Wastewater Discharge Data, 1976. Westborough, Massachusetts. 72 pp.

_____. 1975. South Coastal Water Quality Management Plan. Westborough, Massachusetts. 54 pp.

* No intensive surveys or baseline surveys have been undertaken by the Division's Technical Services Branch in the Islands Drainage Area.

TABLE 24

SOUTH COASTAL BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Cohasset Harbor, Cohasset	--	SA	yes	1976	Coliform bacteria	Cohasset WWTP.	Upgrade Cohasset WWTP to provide secondary treatment.
Scituate Harbor, Scituate	--	SA	yes	1976	Coliform bacteria	Unknown	Eliminate/treat source.
Green Harbor River, Marshfield	--	B	yes	1976	Dissolved oxygen Nutrients Coliform bacteria	Natural wetlands Failing septic systems.	Septic system rehabilitation/maintenance.
Jones River above Wapping Road, Kingston	7.0-3.6	B	yes	1976 1981	Dissolved oxygen	Natural wetlands. Failing septic systems.	Septic system rehabilitation/maintenance.
Jones River from Wapping Road to Elm Street, Kingston	3.6-2.5	B	yes	1976 1981	Occasional dissolved oxygen	Nutrients/ algae.	Septic system rehabilitation/maintenance.
Jones River Estuary, Kingston	2.5-0.0	SA	yes	1976 1981	Coliform bacteria	Untreated domestic wastewater discharges.	Eliminate/treat sources.
Duxbury Bay, Kingston	--	SA	no	1976	None	None	--

TABLE 24 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Plymouth Harbor, Plymouth	--	SA	yes	1976	Coliform bacteria	Plymouth WWTP. Combined sewer overflows. Boating discharges.	Treatment/Elimination of known sewage outfalls to harbor.
Plymouth Bay, Plymouth	--	SA	no	1976	None	None	--

Number of segments assessed - 9
Number of segments meeting standards - 2

SUDBURY AND CONCORD RIVER BASINS

Description of the Watershed

The Sudbury River has its beginning in the town of Westborough, flowing from Cedar Swamp Pond eastward to Framingham, then north through the towns of Sudbury, Wayland, Lincoln, and into the town of Concord. The Sudbury River is characterized by three distinct physical sections. Upstream of Framingham the river is a narrow, rapidly-flowing stream dotted with a few small impoundments. In Framingham, the river has two large impoundments: the first is part of the Metropolitan Distric Commission (MDC) water supply, and the second is created by the Colonna Dam in Saxonville. The third and unique section of the river is that which flows through the Great Meadows National Wildlife Refuge meadowlands in the towns of Sudbury, Wayland, Lincoln, and Concord. Through this area (river distance of 12 miles), the river's elevation changes only one foot and the river is akin to an elongated lake.

The Sudbury River is 41 miles long with a drainage area of 160 square miles, 29 of which drain to the MDC reservoirs. In Concord the Sudbury River joins the Assabet River to form the Concord River.

The Concord River flows north through the towns of Concord, Carlisle, Bedford, Billerica, and the city of Lowell where it flows into the Merrimack River. The Concord River retains the slow-moving characteristic of the Sudbury River as it flows north through the Great Meadows Wildlife Refuge Area. From the Talbot Dam in Billerica, the river is an urban river, receiving industrial and municipal discharges in the Lowell area.

The Concord River is 15.8 miles long and drains 62 square miles, for a combined total (including the Assabet and Sudbury rivers) of 406 square miles. The Concord River Basin has two main urban centers in the Lowell and Concord areas, and some rural areas such as those still found in Carlisle.

The United States Geological Survey (USGS) maintains one flow gaging stations on the Sudbury River in Saxonville. One USGS flow gaging station is maintained on the Concord River in Lowell.

Water Quality Condition and Trends

Unlike the Assabet River which has to contend with a number of WWTP discharges in close proximity, the Sudbury and Concord rivers are relatively free of such impacts. However, natural conditions in the Sudbury and Concord basins, compounded by urban runoff effects, prevent the Sudbury and Concord rivers from maintaining a class B condition along their full lengths. Nevertheless, the 1979 survey data indicate that the upper

SUDBURY AND CONCORD RIVER BASINS

FIGURE 25

portions of both the Sudbury River (16 miles) and the Concord River (9 miles) do meet class B water quality conditions. With the elimination of the CSOs in the Lowell area, more of the Concord River could conceivably be meeting its B classification.

The Metropolitan District Commission maintains a number of reservoirs in the Sudbury basin. Currently it is investigating the feasibility of using water from the Sudbury River to supplement the reservoir yield. However, although the Sudbury River water appears to be suitable as a water supply source (with subsequent treatment), the designation of an Ashland hazardous waste site as a U.S. EPA Superfund site might have ramifications. It should be pointed out that the class B designation for the upper reaches of the Sudbury River could be downgraded in the event investigations show the waste site has a significant impact on the river.

Secondary contact recreation is quite popular on the Sudbury and Concord rivers. The Great Meadows National Wildlife Refuge is a large floodplain through which the rivers languidly flow, making it ideal for canoeing and bird-watching. The Sudbury River in Hopkinton and Ashland is stocked with trout by the Massachusetts Division of Fisheries and Wildlife.

Upgradings at the Concord and Billerica WWTPs will improve water quality below the respective discharges. These improvements along with the elimination of the Lowell CSOs will have the most significant impact on improving water quality. Septic system rehabilitation/maintenance and runoff control might be necessary in some areas to achieve class B standards.

A major tributary to the Sudbury River is Hop Brook. Hop Brook is severely impacted at its headwaters by nutrients from the Marlborough-Easterly WWTP, this despite the fact that the WWTP is well operated and practices both nitrification and phosphorus removal. Unfortunately a series of impoundments allows for the accumulation of the available nutrients in the water column and sediment. Extremely dense algae populations coupled with extreme diurnal dissolved oxygen swings result in significant water quality violations and limits uses.

Diversion of the WWTP discharge from Hop Brook is a possible solution but a costly one. The problem is currently under study by the United States Geological Survey.

Lakes and Ponds

Inventory

Number of lakes and ponds	63
Surface area of lakes and ponds (acres)	4,485
Number of lakes and ponds greater than 10 acres	41
Surface area of lakes and ponds greater than 10 acres	4,373
Number of officially recognized Great Ponds	6
Surface area of officially rocognized Great Ponds (acres)	442

Intensive Surveys

Lake	Location	Survey Period	Report Publication Date
Lake Cochituate	Natick/Framingham/Wayland	1979-1981	*
Nutting Lake	Billerica	1974-1985	April 1976
Waushakum Pond	Ashland/ Framingham	1975-1976	August 1977

* Publication in progress

Classification

Lake	Location	Stratification	Severity Points
Ashland Reservoir	Ashland	S	5
Carding Millpond	Sudbury	U	13
Lake Cochituate (Carling, Middle, North Basins)	Framingham/ Natick/Wayland	S	12
Lake Cochituate (South Basin)	Natick	S	10
Dudley Pond	Wayland	S	5
Gristmill Pond	Sudbury	U	15
Hager Pond	Marlborough	U	12
Heart Pond	Chelmsford	S	7
Nutting Lake	Billerica	U	10
Stearn's Mill Pond	Sudbury	U	12
Waushakum Pond	Ashland/ Framingham	S	9
White Pond	Concord	S	5
Winning Pond	Billerica	U	9

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TABLE 25

SUDBURY AND CONCORD RIVER BASINS

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Sudbury River from the headwaters in Westborough to Saxonville Pond outlet, Framingham	32.7-16.2	B	no	1979	Possible contamination from hazardous waste site	Hazardous waste site potentially.	Meets class B standards except for naturally occurring D.O. concentrations in headwaters. Clean up of hazardous waste site.
Sudbury River from Saxonville Pond outlet to Wash Brook confluence, Wayland	16.2-10.5	B	yes	1979	Coliform bacteria	Runoff, natural sources, septic systems.	Minor coliform bacteria violations; might not be subject to control if from natural sources.
Sudbury River from Wash Brook confluence, Wayland, to confluence with Assabet River, Concord	10.5-0.0	B	yes	1979	D.O., coliform bacteria	Runoff, natural sources, septic systems.	Improved septic system maintenance; might not be subject to control if from natural sources.
Hop Brook from the Marlborough Easterly WWTP discharge to the confluence with the Sudbury River, Wayland	9.7-0.0	B	yes	1979	D.O., nutrients, algae	WWTP plus multiple impoundments.	Diversion of WWTP discharge to Sudbury River; dredging of impoundments.
Concord River from confluence of the Assabet and Sudbury rivers to the Billerica WWTP outfall, Billerica	15.4-6.1	B	no	1979	--	--	--
Concord River from Billerica WWTP outfall to confluence with Merrimack River, Lowell	6.1-0.0	B	yes	1979	Coliform bacteria	Combined sewer outfalls (CSO), urban runoff.	CSOs were eliminated after 1979 survey.

Total miles assessed	(Sudbury River) - 32.7 (Concord River) - 15.4 (Hop Brook) - 9.7	Total miles meeting standards	(Sudbury River) - 16.5 (Concord River) - 9.3 (Hop Brook) - 0.0

TAUNTON RIVER BASIN

Description of the Watershed

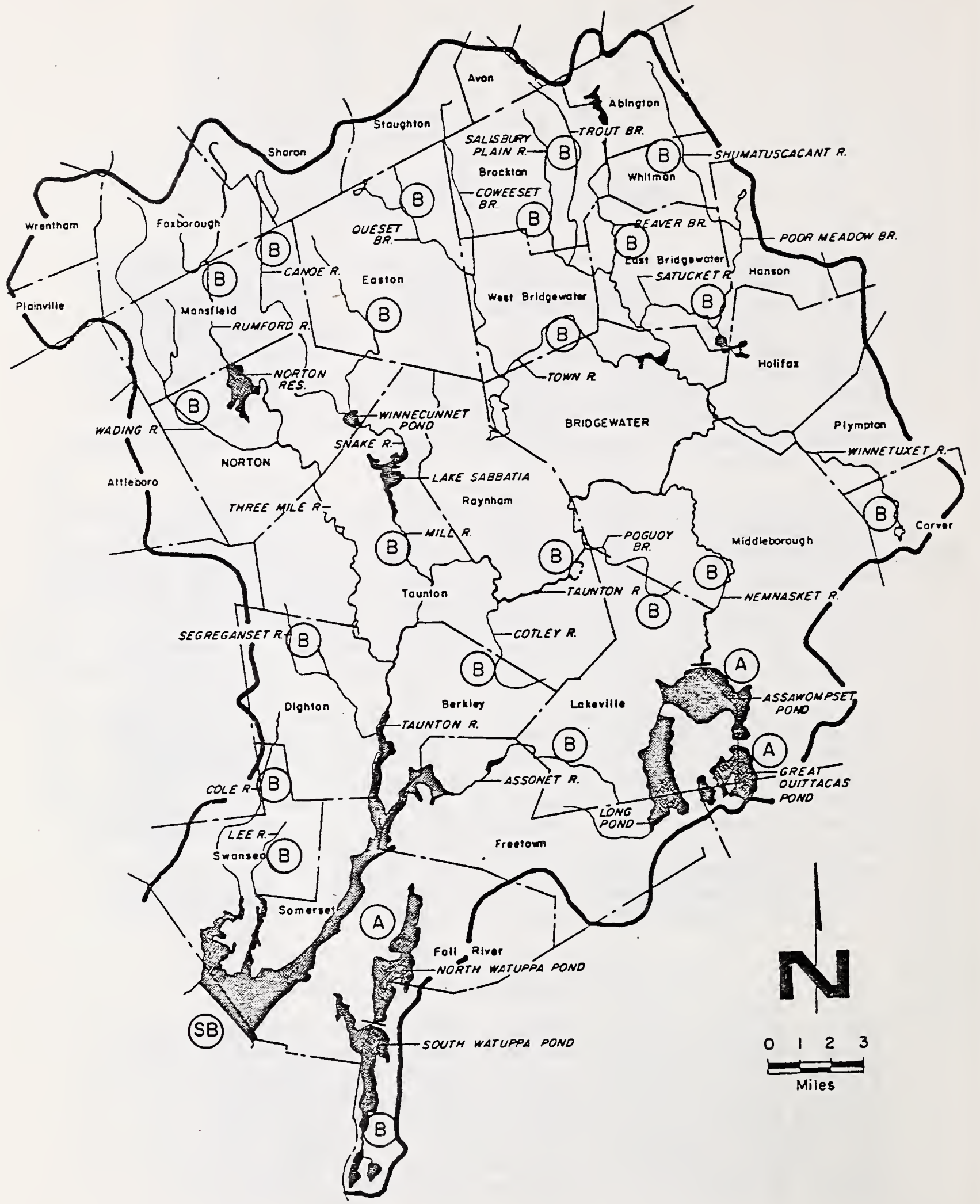
The Taunton River, located in southeastern Massachusetts, is formed at the confluence of the Matfield and Town rivers in the town of Bridgewater. The river, 40 miles in length, flows in a southerly direction and discharges into Mount Hope Bay in the Narragansett Bay Watershed. Flowing unobstructed for its entire length, the Taunton River has an extremely flat gradient, ranging from approximately twenty feet at its origin to sea level in Mount Hope Bay. The river is fairly uniform in width in its freshwater portion and then broadens into an estuary. Saltwater intrusion occurs upstream to river mile 12 and tidal influence occurs upstream to river mile 18.

The watershed drains an area of 530 square miles with a myriad of tributary and sub-tributary systems contributing flow to the main stem of the Taunton River. At the headwaters of the basin, the Salisbury Plain and Satucket rivers are the main contributors to the Matfield River while Coweeset and Queset brooks are tributaries to the Town River. In the eastern portion of the basin, the Winnetuxet, Nemasket and Assonet rivers are the major inputs while the Mill, Threemile and Segreganset rivers are the major drainage areas in the western portion of the basin.

The United States Geological Survey formerly maintained a stream gage on the Taunton River in Bridgewater. The gage, which was discontinued in 1976, measured flow from an area of 260 square miles, or 49% of the entire Taunton River Basin. The average annual discharge for 46 years of record was 464 cfs while the maximum discharge was 4,980 cfs and the minimum was 9 cfs. The USGS maintains two gages on the Wading River and one each on the Threemile and Segreganset rivers. The average discharge per square mile for the five gages is: Taunton River - 1.78 cfs/mi^2; Wading River - 1.71 and 1.73 cfs/mi^2; Threemile River - 2.14 cfs/mi^2; Segreganset River - 2.20 cfs/mi^2.

Water Quality Conditions and Trends

The waters of the Taunton River Basin have historically been subjected to significant wastewater inputs and resultant water quality problems. The last decade has produced significant abatement actions in the basin in which municipal facilities were upgraded, industrial discharges received treatment and some discharges eliminated. Currently, there are 71 discharges which have NPDES permits in the Taunton River Basin. Of this total, 23 discharges are classified as major and each discharge is treated and subject to effluent limits as stated in their permit.



TAUNTON RIVER BASIN

FIGURE 26

The major discharges are from the following type facilities: 7 municipal wastewater treatment plants, 2 power plants, 1 chemical processing plant, 1 industry's sanitary wastewater treatment plant and 12 plating companies.

There are four main areas in the Taunton River Basin which receive wastewater discharges and have water quality problems related to those discharges. In the upper portion of the basin, the Town and Matfield rivers are impacted by discharges from the Brockton and Bridgewater WWTPs. The streams are subject to dissolved oxygen deletion, periodic bacteria contamination, heavy metals input and accelerated eutrophication. The water quality problems reach an apex in the Paper Mill Impoundment which is located at the confluence of the Town and Matfield Rivers. This hyper-eutrophic impoundment has severe water quality problems. The flow from the impoundment represents the beginning of the Taunton River proper and the water quality problems, particularly low dissolved oxygen, are present for several miles downstream of the impoundment.

In the upper portions of the Threemile River Basin, the Mansfield WWTP discharges to Back Bay Brook, a tributary to Norton Reservoir and the Rumford River. This discharge creates severe water quality problems and adds significant nutrients to the reservoir which promotes accelerated eutrophication. A bleachery formerly discharged untreated wastewater with an extremely high oxygen demand to a tributary of the Wading River. The company has ceased operation and hence, this loading to the river has been eliminated.

A third major area in the basin which receives significant discharges is in the area of the city of Taunton. Numerous industrial discharges, primarily plating operations and the Taunton WWTP discharge to the Taunton River. Before substantial abatement actions were undertaken, the Taunton River was subjected to large organic loadings, high ammonia-nitrogen levels, bacterial contamination and heavy metals. All the remaining industrial discharges receive substantial treatment while the Taunton WWTP was upgraded to advanced treatment in 1978. Survey data in 1981 showed significant improvement in dissolved oxygen levels downstream of these discharges due to the reduction in organic loadings and the nitrification process at the Taunton WWTP.

The fourth major area which receives significant volumes of wastewater is in the vicinity of the city of Fall River. Combined sewer overflows and the discharges from the Somerset and Fall River WWTPs add large organic loads to the Taunton River/Mount Hope Bay. This portion of the river is tidal and is subject to tidal mixing and dispersion. However, the large loadings have created dissolved oxygen, nutrient and bacterial problems.

As previously mentioned, abatement actions in the past decade have significantly reduced the wastewater loadings to the waters in the Taunton River Basin which has created improvements in water quality. The programs instituted or being planned at the municipal treatment facilities are significant: (1) The Brockton WWTP is being upgraded to advanced treatment with construction scheduled for completion in 1983; (2) the Bridgewater WWTP is currently in the facilities planning phase with

improvements to the plant anticipated by 1987; (3) the Middleborough WWTP was upgraded to advanced treatment in 1977 and produces an effluent with extremely low oxygen demand levels; (4) the Taunton River WWTP was upgraded to advanced treatment in 1978 which has resulted in documented water quality improvements in the Taunton River; (5) the Mansfield WWTP will be replaced at a new location by an advanced treatment system with the discharge removed from Back Bay Brook and the new discharge will be to the Three Mile River; (6) the Somerset WWTP is currently under the facilities planning process which will address the inflow/infiltration problem which periodically hydraulically overloads the plant and creates system wash-outs. Improvements to the facility should be completed by 1987; (7) the Fall River WWTP is currently under construction to upgrade the primary facility to secondary treatment which will reduce the organic loads from the plant by approximately 80%. The project is scheduled for completion in 1983.

The quality of the Taunton River and its tributaries, which was despicable for decades, has been significantly improved in the past decade. Future abatement actions should enhance the recovery of the valuable resources of the Taunton River Basin.

Lakes and Ponds

Inventory

Number of lakes and ponds	221
Surface area of lakes and ponds (in acres)	16,255
Number of lakes and ponds greater than 10 acres	137
Surface area of lakes and ponds greater than 10 acres	15,760
Number of officially recognized Great Ponds	10
Surface area of officially recognized Great Ponds (in acres)	4,730

Intensive Surveys

Lakes	Location	Survey Period	Date of Report Publication
South Watuppa Pond	Fall River/ Westport	1974-1975	June 1977
Norton Reservoir	Mansfield/ Norton	1975-1976	July 1980

Classification

Lake	Location	Stratification	Severity Points
Brockton Reservoir	Avon	S	8
Chartley Pond	Norton/Attleboro	U	13
Cleveland Pond	Abington	U	12
Furnace Pond	Pembroke	U	6
Hobart Pond	Whitman	U	14
Island Grove Pond	Arlington	U	10
Nippenicket Lake	Bridgewater	U	7
North Watuppa Pond	Fall River/Westport	U	2
Norton Reservoir	Mansfield/Norton	U	10
Robbins Pond	Bridgewater	U	5
Lake Sabbatia	Taunton	S	11
South Watuppa Pond	Fall River/Westport	U	9
Thirtyacre Pond	Brockton	U	4
Waldo Pond	Avon/Brockton	U	7
Wampatuck Pond	Hanson	U	10
Winnecunnet Pond	Norton	U	8

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TABLE 26

TAUNTON RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Taunton River from the confluence of the Town and Matfield rivers to Route 24 bridge, Taunton	40.8-21.2	B	yes	1975	Dissolved oxygen	Brockton WWTP. Bridgewater WWTP.	Brockton is being up graded to AWT. Bridgewater is undergoing facilities planning.
Taunton River from the Route 24 bridge, Taunton to the Berkley Bridge, Dighton	21.2-13.0	SB	yes	1975 1981	Dissolved oxygen	Upstream sources. Taunton WWTP.	Upstream control measures will reduce problems.
Taunton River from the Berkley Bridge, Dighton to Fall River city line	13.0-7.5	SB	no	1975 1981	--	--	--
Taunton River from the Fall River city line to mouth in Mount Hope Bay	7.5-0.0	SB	yes	1975	Coliform bacteria	CSO. Fall River WWTP.	CSO control needed. Fall River is being upgraded to secondary.
Matfield-Salisbury Plain River from Prospect Street, Brockton to confluence with the Town River, Bridgewater	53.3-40.8	B	yes	1975	Dissolved oxygen Coliform bacteria Ammonia	Urban runoff. Brockton WWTP.	Runoff control. Upgrading of WWTP will be completed in 1983.
Trout Brook from Route 28, Avon to confluence with the Salisbury Plain River, Brockton	4.0-0.0	B	yes	1975	Dissolved oxygen Coliform bacteria	Eutrophication unknown.	Possibly urban runoff control; source of problem not clearly defined.
Beaver Brook from Groveland Street, Brockton to confluence with the Salisbury Plain River, East Bridgewater	5.5-0.0	B	yes	1975	Dissolved oxygen Coliform bacteria	Wetlands. Stormwater.	Undefined.

TABLE 26 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Satucket-Shumatuscacant rivers from Central Street, Abington to confluence with the Matfield River, East Bridgewater	14.4-0.0	B	yes	1975	Dissolved oxygen Coliform bacteria	Wetlands undefined.	Facilities planning for Abington and Whitman.
Town-Hockomock rivers from the confluence of Queset and Coweeset brooks, West Bridgewater to confluence with Matfield River, Bridgewater	11.7-0.0	B	yes	1975	Dissolved oxygen	Wetlands. Eutrophication. Bridgewater. WWTP.	Vast wetland area causes natural low dissolved oxygen. Bridgewater WWTP undergoing facilities planning.
Robinson Brook from Cocasset Street, Foxborough to confluence with Rumford River, Foxborough	3.0-0.0	B	yes	1975	Dissolved oxygen Ammonia Coliform bacteria	Foxborough Co. WWTP.	Possible upgrading of WWTP.
Rumford-Threemile rivers from Cocasset Street, Foxborough to outlet of Norton Reservoir, Norton	21.4-14.7	B	yes	1975	Dissolved oxygen Coliform bacteria	Undetermined. Mansfield WWTP at river mile 15.8.	Mansfield WWTP will be upgraded by 1985; upstream problems need to be qualified.
Threemile River from outlet of Norton Reservoir, Norton to confluence with Taunton River, Dighton	14.7-0.0	B	yes	1975	Coliform bacteria	CSO in Dighton.	Control and/or elimination of CSO problem in downstream section (river mile 1.3-0.0).
Wading River from Spruce Street, Foxborough to confluence with Threemile River, Norton	11.3-0.0	B	no	1975	Dissolved oxygen	Wetlands.	Natural Condition.

TABLE 26 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Segreganset River from Center Street, Dighton to confluence with Taunton River, Dighton	2.5-0.0	B	yes	1975	Dissolved oxygen Coliform bacteria	Diurnal variation unknown.	Further quantification of problem is needed.
Assonet River from Route 74, Freetown to confluence with Taunton River, Freetown	6.0-0.0	B	yes	1975	Dissolved oxygen	Wetlands unknown.	Further qualification of of problem is needed.
Queset Brook from outlet of Longwater Pond, Easton to confluence with Coweeset Brook, West Bridgewater	2.8-0.0	B	no	1975	--	--	--
Coweeset Brook from Pearl Street, Brockton to confluence with Queset Brook, West Bridgewater	3.6-0.0	B	no	1975	--	--	--
Winnetuxet River from Route 58 to confluence with Taunton River, Halifax	6.7-0.0	B	yes	1975	Dissolved oxygen Coliform bacteria	Wetlands. Cropland drainage.	Natural condition. Proper control of fertilizer runoff needed.
Nemasket River from Vaughan Street, Middleborough to confluence with the Taunton River, Middleborough	10.5-0.0	B	no	1975 1980 1981	Dissolved oxygen	Diurnal variation from macrophyte growth.	Natural condition.
Canoe-Snake rivers from Cocasset Street, Foxborough to outlet of Lake Sabbatia, Taunton	18.2-3.1	B	no	1975	Dissolved oxygen	Wetlands.	Natural condition.

TABLE 26 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Mill River from outlet of Lake Sabbatia, Taunton to confluence with Taunton River, Taunton	3.1-0.0	B	yes	1975 1981	Dissolved oxygen Coliform bacteria	CSO in Taunton.	Control and/or elimination of CSO.

Total miles assessed (Taunton River) - 40.8
Total miles meeting standards (Taunton River) - 6.5

Total miles assessed (tributaries) - 134.1
Total miles meeting standards (tributaries) - 43.3

TEN MILE RIVER BASIN

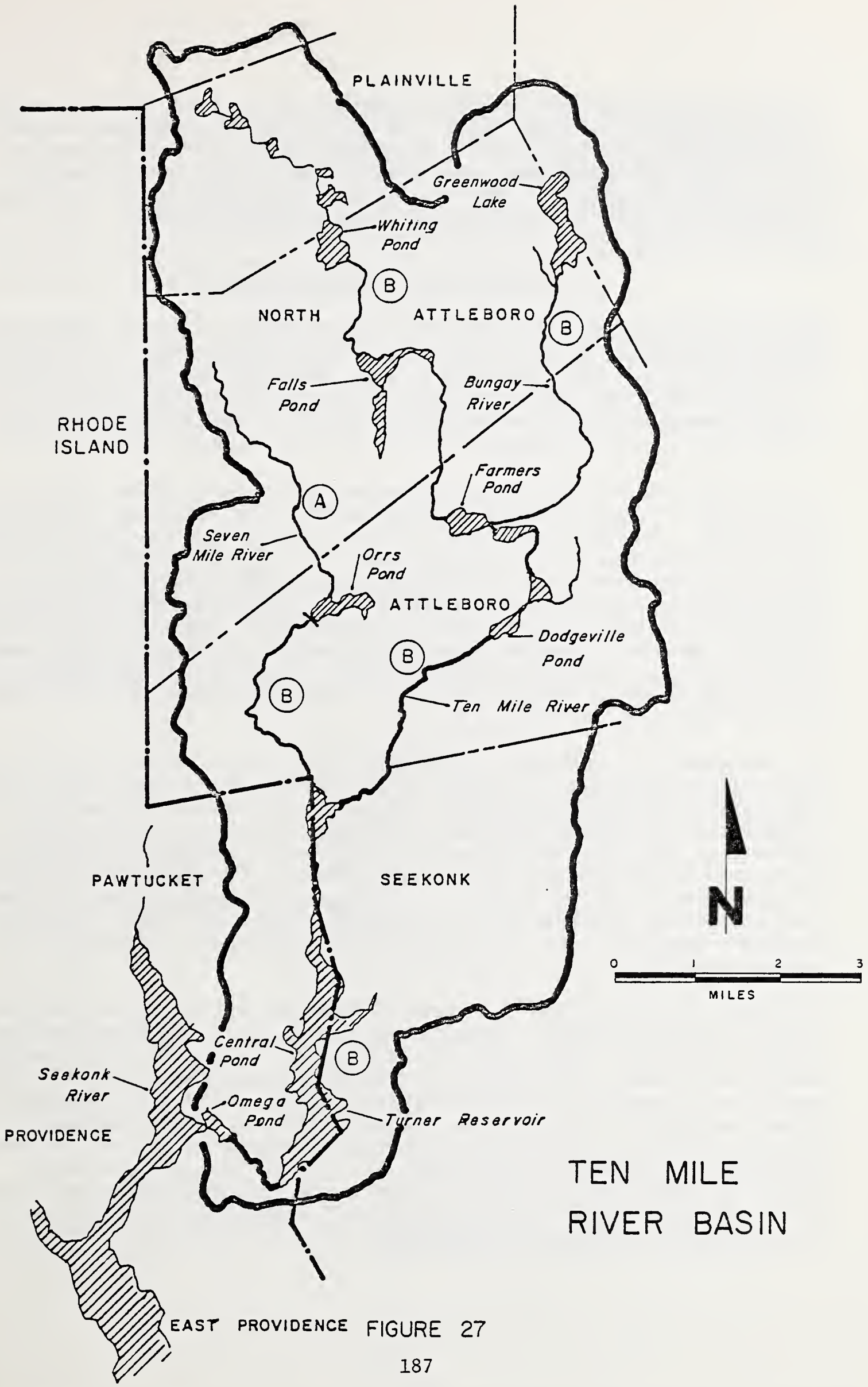
Description of the Watershed

The Ten Mile River drains an area of 54 square miles in southeastern Massachusetts and eastern Rhode Island. Originating in Savage's Pond in Plainville, Massachusetts, the stream flows generally southwest through North Attleborough, Attleboro and Seekonk to Pawtucket and East Providence, Rhode Island where it turns northwest and empties into the Seekonk River. The total length of the river is 22 miles, of which 15 are in Massachusetts. The elevation of the riverbed drops from 230 feet above mean sea level at the source to ten feet at the mouth for an average fall of ten feet-per-mile. Flow is highly restricted, with various dams creating a total of 15 impoundments. These impoundments comprise almost half the length of the river. Most of the remaining length is enclosed in concrete or masonry retaining walls which severely affect natural processes.

There are two major tributaries to the Ten Mile, the Bungay and Sevenmile rivers. The former begins in a wetland in North Attleborough and flows south approximately five miles, joining the Ten Mile just above Mechanics Pond in Attleboro. Drainage area of the Bungay River Basin is 7.8 square miles. The Sevenmile River drains an area of 12.7 square miles. Flowing south from a wetland just east of North Attleborough center to join the Ten Mile at the state line, its total length, as its name professes, is seven miles.

The Massachusetts portion of the Ten Mile River Basin is primarily located in the towns of Plainville, North Attleborough, and Seekonk and the city of Attleboro. Small parts of Foxborough, Wrentham, Mansfield and Rehoboth are also located within the watershed. In 1975, about 60,000 persons lived in the Massachusetts portion, a density of 1,250 persons per square mile. Urban development within the basin is densest along the river. Land-use throughout the basin is estimated to be 46 percent forest, 26 percent urban, 8 percent agriculture, 4 percent water and 16 percent other (including shrub swamps, non-forested recreation land, abandoned agricultural land, etc.).

Land elevations in the basin range from sea level at the outlet to over 400 feet in the northern portion. Low, gently rolling hills are the dominant topographical features. Much of the lowlands consists of wooded swamp and shrub swamp. Glacial till soils are common in the higher elevations; the lower areas are characterized by soils of glacial outwash materials. The outwash soils are typically sandy and gravelly, while the till soils contain more silt and clay.



TEN MILE
RIVER BASIN

FIGURE 27

The basin has a temperate climate typical of coastal New England. Average annual temperature is about 50°F. The coldest month is February with a mean temperature of 29°F, while the warmest month is July with a mean of 72°F. Freezing temperatures occur over 100 days a year on the average. Precipitation is generally well distributed throughout the year, averaging 44 inches annually. Annual snowfall averages about 34 inches.

Water Quality Conditions and Trends

For two centuries, the Ten Mile River Basin has been a center for industrial development, particularly in the jewelry manufacturing field. In 1780, the first jewelry shop was opened and in 1807, the first manufacturing plant was built. In addition, textiles and tanneries were prevalent with the first tannery opened in 1787. The industrial nature of the river basin brought accompanying waste disposal and water quality problems.

In 1964, none of the industrial wastewater discharges received any treatment and the two major municipal areas provided some treatment of the domestic wastewaters. In 1968, there were 65 known discharges to the Ten Mile River and its tributaries, 57 of these discharges received no treatment. By 1973, through an intensive program governed by the U.S. EPA and the Division of Water Pollution Control and with significant cooperation from the industries, the wastewater disposal problems in the basin were being alleviated through an intensive abatement program. Some discharges were pre-treated and conveyed to the municipal wastewater treatment plant. There were 40 discharges to the river, each of which received treatment. This was a remarkable turn around in such a short period of time.

The two municipal wastewater discharges to the river, the North Attleborough and Attleboro wastewater treatment facilities had historically caused water quality problems. Aging sewerage systems and untreated industrial influents complicated the problems of proper operation of the existing facilities. However, in 1980, both facilities were upgraded to advanced wastewater treatment, thus significantly reducing the loadings to the stream and lessening the resultant water quality problems. The Attleboro facility is experiencing some operational problems due to industrial shock loads. With proper pretreatment regulations and enforcement, this facility will produce a high quality effluent.

During the period when the industrial discharges were untreated, heavy metals, acids and various organic compounds were discharged to the river and created a toxic environment. This toxic nature limited the biota of the stream rendering the stream to the role of just a conveyor of sewage. With the implementation of treatment of the industrial discharges, the toxic nature of the river was reduced. However, organic loadings to the stream continued to delete dissolved oxygen levels; wastewaters continued to provide nutrients necessary for excessive algal growth; and improper disinfection caused bacterial contamination. The upgrading of the municipal wastewater treatment facilities and other abatement projects will significantly improve water quality but not eliminate all problems.

The Ten Mile River has a small watershed and is subject to low flow conditions during summer drought conditions. The stream is impounded at 15 locations which creates ideal conditions for eutrophication and provides a sink for sedimentation. The sediments have excess quantities of heavy metals; the effect of the metals upon the biota of the stream is not clear but could be adverse. This aspect of the river's dynamics needs increased attention. The river is an urban river and hence is subject to runoff and the associated problems of oil and grease, silt and bacteria. These conditions will cause problems and need to be addressed in more detail.

The future water use of the Ten Mile River will be limited by its hydraulic restraints and the possible toxicity of the sediments. The wastewater discharges will be well controlled and the water column will have an improved quality but it will be subject to continuing degrees of eutrophication. Its use will be typical of that of a recovered urban river generally limited to passive recreation.

Lakes and Ponds*

Number of lakes and ponds	50
Surface area of lakes and ponds (in acres)	1,565
Number of lakes and ponds greater than 10 acres	27
Surface area of lakes and ponds greater than 10 acres	1,438
Number of officially recognized Great Ponds	0

Classification

Lake	Location	Stratification	Severity Points
Attleboro Gravel Pit #1	Attleboro	U	4
Attleboro Gravel Pit #2	Attleboro	U	3
Dodgeville Pond	Attleboro	U	13
Falls Pond	North Attleborough	S	10
Farmers Pond	Attleboro	U	15
Hebronville Pond	Attleboro	U	13
Mechanics Pond	Attleboro	U	15
Turnpike Lake	Plainville	U	6

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Ten Mile River Basin.

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TABLE 27

TEN MILE RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Headwaters in Plainville to the outlet of Whiting Pond, North Attleborough	22.6-18.8	B	yes	1973 1979 1981	Dissolved oxygen	Algae.	Possible phosphorus limitations needed.
Outlet of Whiting Pond, North Attleborough to North Attleborough WWTP effluent	18.8-15.1	B	no	1973 1979 1981	Solids Color	Algae.	Possible phosphorus limitations needed.
North Attleborough WWTP effluent to Attleboro WWTP effluent	15.1-7.7	B	yes	1973 1979 1981	Dissolved oxygen Coliform bacteria Eutrophication	Organic loads. Untreated discharges. Algae.	Control of discharges to Speedway Brook. Sediment control in impoundments.
Attleboro WWTP effluent to the confluence with the Seekonk River, East Providence, R.I.	7.9-0.0	B	yes	1973 1979 1981	Dissolved oxygen Coliform bacteria Eutrophication	Organic loads. Algae. WWTP.	Pre-treatment of input to WWTP. Control nutrients. Sediment control in impoundments.

Total miles assessed - 22.6
Total miles meeting standards - 3.7

WESTFIELD RIVER BASIN

Description of the Watershed

The Westfield River basin covers 517 square miles of west-central Massachusetts and includes portions of Franklin, Hampshire, Hampden, and Berkshire counties. Sparsely populated in the upper reaches, the basins population is concentrated in the southeastern corner in the municipalities of Agawam, Holyoke, Westfield, and West Springfield.

The Westfield River begins in Savoy at a point over 2,000 feet above mean sea level. Flowing southeast, with ridges rising 500 to 900 feet above the adjacent valleys, the river remains mostly in its natural state, surrounded by second and third-growth forest cover. The tops of the hills have been rounded and scoured by glaciation exposing bedrock through the thin till cover. Dropping 1,000 feet in the first 14 miles, the river swiftly makes its way to Huntington where it is joined by the middle and west branches. An area of unique beauty and natural recreational advantages (including Knightville Reservoir), it is enjoyed by sportsmen and naturalists.

Below Huntington the river flows over three dams in succession and the river slope decreases as it approaches in the town of Westfield. The Westfield River is joined by the Little River 11 miles above its mouth, just as the river is reaching the floodplain of the Connecticut River. The river deepens and winds its way through Robinson State Park and over one more dam in West Springfield before it joins the Connecticut.

The Middle Branch of the Westfield River begins in the town of Peru and flows 18 miles to join the main branch 27 miles above its mouth. Falling 1,250 feet along its course, the Middle Branch has a drainage are of 52.6 square miles and an average flow of 102 cfs at the United States Geological Survey gage just above its confluence with the main branch.

In Becket, the West Branch of the Westfield River is formed by the confluence of Depot and Yokum brooks. This branch flows 17.5 miles through Becket, Middlefield and Chester, falling 840 feet before joining the Main Branch in Huntington 25 miles above its mouth. At the United States Geological Survey gage 1.5 miles upstream of its confluence, the West Branch has an average flow of 182 cfs and drains an area of 93.7 square miles.

The Little River, often referred to as the Westfield Little River because of another tributary stream in Huntington with the same name, begins at the outlet of Cobble Mountain Reservoir in Blandford. From the outlet the river flows 13 miles through Russell and Westfield to join the Westfield River 11 miles above its mouth.

WESTFIELD RIVER BASIN

FIGURE 28

Major industries in the basin include the manufacture of paper and abrasives. These are "wet" industries and result in waste discharges to the rivers. With the rise of the economic importance of recreation to the area, it becomes more important to share the Westfield River's 930 cfs average flow to include all of its varied uses. Water resources are, therefore, vitally important to the area.

Water Quality Conditions and Trends

The waters of the upper portion of the Westfield River Basin (east, west, and middle branches) remain unpolluted, owing to the sparse population and lack of industry. These waters are occasionally degraded by heavy silt loads which are associated with periods of heavy precipitation.

Fecal coliform criteria for Class B waters are violated in the West Branch by the discharge of untreated sewage in the town of Chester. This source of domestic pollution is, in part, responsible for continued coliform violations downstream.

Under normal flow conditions, the main stem of the Westfield River, from the confluence of the three branches to the dam at Woronoco (Strathmore Paper Co.), meets Class B water quality criteria, with the exception of fecal coliform levels. Recently completed pollution abatement projects along this river segment are responsible for the significant improvement in river water quality.

Below the dam at Woronoco to the confluence with the Little River, the Westfield River begins to slow, resulting in an accumulation of wastes from all upstream sources. This section formerly experienced Class B oxygen and coliform criteria violations. Since the elimination of many of these untreated upstream sources, no oxygen violations occur under any but extreme low flow conditions, and fecal coliform concentrations have been greatly reduced.

The Westfield River, from the confluence of the Little River to the confluence with the Connecticut River, bears the assimilative burden for a large portion of the Westfield River Basin. Class B fecal coliform criteria are violated. The river is aesthetically degraded by sludge and color in the Robinson State Park area. Class B oxygen criteria are maintained due to high reaeration rates upstream and the reduced amount of oxygen-demanding materials being introduced from upstream sources.

The water quality of the Little River has improved due to continuing pollution abatement. Untreated discharges no longer exist. Upstream agricultural runoff during periods of heavy precipitation causes pH violations and increased BOD levels in the impoundment behind the Stevens Paper Mills' upper dam. Class B fecal coliform criteria are still violated at the mouth of the river due to a stormwater outfall which, until recently, was a combined sewer outfall.

Nightly releases from Cobble Mountain Reservoir appear to have an impact on limiting benthic populations in the Little River as a result of variances in water level and not water quality.

Many advances in pollution abatement have been made over the last decade in the Westfield River Basin. All of the major point sources of pollution receive some degree of treatment before discharge.

On the West Branch of the Westfield River, the town of Huntington has just recently seen its new sewage treatment plant become operational. Plans also call for sewer and treatment plant construction to be initiated in the town of Chester. These projects, when completed, will have a great effect on reducing and possibly eliminating the fecal coliform violations of Class B water quality criteria in the West Branch.

Engineering reports are being prepared for the upgrading of the present sewage treatment facility in Russell and the extension of the existing sewer system in that town to include the Woronoco and Crescent Mills sections. Texon Paper Company and Strathmore Paper Company, both located in Russell, each operate their own treatment facility. Though both facilities do occasionally experience operational difficulties, adequate treatment is provided to meet present effluent limitations and Class B water quality of the receiving waters.

The city of Westfield has recently completed construction extending its sewer system to eliminate all untreated combined sewers in the city. Remaining problems in Westfield are primarily infiltration/inflow at the city sewage treatment plant and the accumulation of nutrients instream just below the city in the area of Robinson State Park.

Stevens Paper Company's lower mill currently provides adequate treatment of its wastewater to meet permit limitations. The upper mill at Stevens has ceased all paper making operations and no longer discharges to the Little River. Nightly discharges from Cobble Mountain Reservoir will continue to have a deleterious effect on both the benthic macroinvertebrate and indigenous fish populations in the Little River.

Domestic and industrial wastewater in the Westfield Basin downstream of the city of Westfield is or will be treated at the Springfield Regional Wastewater Treatment Plant (Bondi Island).

Lakes and Ponds*

Inventory

Number of lakes and ponds	78
Surface area of lakes and ponds (acres)	4,422
Number of lakes and ponds greater than 10 acres	48
Surface area of lakes and ponds greater than 10 acres	4,264
Number of officially recognized Great Ponds	10
Surface area of officially recognized Great Ponds (acres)	1,059

Classification

Lake	Location	Stratification	Severity Points
Buck Pond	Westfield	S	11
Buckley-Dunton Lake	Becket	U	7
Congamond Lakes (Middle)	Southwick	S	13
Congamond Lakes (North)	Southwick	S	12
Congamond Lakes (South)	Southwick	S	13
Cooley Lake	Granville	U	8
Damon Pond	Chesterfield/Goshen	U	9
Hammond Pond	Goshen	U	10
Horse Pond	Westfield	U	5
Norwich Pond	Huntington	S	9
Pequot Pond	Westfield	S	4
Rudd Pond	Becket	S	6
Russell Pond	Russell	S	8
Windsor Pond	Windsor	S	8
Yokum Pond	Beckett	U	3

* No intensive surveys have been undertaken by the Division's Technical Services Branch in the Westfield River Basin.

References

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TABLE 28

WESTFIELD RIVER BASIN

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
West Branch							
Source in Becket to confluence with Walker Brook, Chester	17.5-7.3	B	no	1965 1978	None	None	None
Confluence with Walker Brook, Chester to confluence with main stem Westfield River, Huntington	7.3-0.0	B	yes	1965 1978	Coliform bacteria	Untreated domestic discharges. Combined sewer overflows in Chester.	Separation of sewage and stormwater collection systems.
Middle Branch							
Source in Peru to Littleville Dam	18.1-1.0	A	no	1965	None	None	None
Littleville Dam to confluence with main stem Westfield River, Huntington	1.0-0.0	B	no	1965 1978	None	None	None
Main Stem Westfield River							
Source in Savoy to confluence with Middle Branch, Huntington	62.5-27.0	B	no	1965 1978	None	None	None
Confluence with Middle Branch to confluence with West Branch, Huntington	27.0-25.1	B	no	1965 1978	Coliform bacteria	Isolated domestic discharges. Stormwater runoff.	Tie-in remaining discharges to the Huntington WWTP.
Confluence with West Branch to above city of Westfield	25.1-16.2	B	yes	1965 1972 1974 1978	Occasional coliform bacteria. pH	Stormwater runoff. Isolated domestic discharges. Acid rain.	Sewer extensions and rehabilitation of the Russell WWTP.

TABLE 28 (CONTINUED)

SEGMENT DESCRIPTION	RIVER MILES	WATER USE CLASSIFICATION	STANDARDS VIOLATIONS?	DATA BASE YEAR(S)	WATER QUALITY PROBLEM(S)	SOURCE(S) OF PROBLEMS	ABATEMENT NEEDS TO MEET CLASSIFICATION
Main Stem (Continued)							
Above city of Westfield to confluence with Connecticut River, West Springfield-Agawam	16.2-0.0	B	yes	1965 1972 1974 1978 1979	Occasional coliform bacteria	Stormwater runoff.	Stormwater runoff management.
Westfield Little River from Cobble Mountain Reservoir in Blandford to Broad Street bridge, Westfield	4.7-2.0	B	no	1965 1972 1974 1978 1979	None	Agricultural runoff.	Stormwater runoff management.
Broad Street bridge, Westfield to confluence with Westfield River, Westfield	2.0-0.0	B	yes	1965 1972 1974 1978 1979	Occasional coliform bacteria	Urban runoff.	Stormwater runoff management.
Powdermill Brook from confluence with Arm Brook to confluence with Westfield River, Westfield	3.2-0.0	B	no	1978	none	Stormwater runoff.	Stormwater runoff management.

Total miles assessed (Westfield River) - 98.1
Total miles meeting standards (Westfield River) - 65.7

Total miles assessed (tributaries) - 7.9
Total miles meeting standards (tributaries) - 5.9

APPENDIX 1

Commonwealth of Massachusetts

Water Resources Commission

Division of Water Pollution Control

WATER QUALITY STANDARDS

PART 1 GENERAL PROVISIONS

Regulation 1.1 Title. These regulations shall be known as the "Massachusetts Water Quality Standards."

Regulation 1.2 Organization of Standards. The Massachusetts Water Quality Standards are comprised of five units: General Provisions (Part 1), Application of Standards (Part 2) Water Quality Criteria (Part 3), Antidegradation Provisions (Part 4) and Basin Classifications and Maps (Part 5).

Regulation 1.3 Authority. The Massachusetts Water Quality Standards are adopted by the Division pursuant to the provisions of M.G.L. c.21, §27 and other enabling acts relating thereto.

Regulation 1.4 Purpose. The Massachusetts Act charges the Division with the duty and responsibility to enhance the quality and value of the water resources of the Commonwealth and directs the Division to take all action necessary or appropriate to secure to the Commonwealth the benefits of the Federal Act. The objective of the Federal Act is the restoration and maintenance of the chemical, physical and biological integrity of the Nation's waters. As a goal towards this objective, the Federal Act requires, by 1983, the achievement of water quality which provides for the protection and propagation of fish, shellfish and wildlife and provides for recreation in and on the water wherever attainable. To achieve the foregoing requirements the Division has adopted the Massachusetts Water Quality Standards which designate the uses for which the various waters of the Commonwealth shall be enhanced, maintained and protected; which prescribe the water quality criteria required to sustain the designated uses; and which contain regulations necessary to achieve the designated uses and maintain existing water quality including, where appropriate, the prohibition of discharges.

Regulation 1.5 Definitions. As used in these standards, the following words have the following meanings:

Artificial conditions - Those conditions resulting from human alteration of the chemical, physical or biological integrity of waters.

Beneficial use - Any use not impairing the most sensitive use designated in the classification tables contained in Part 5; except that in no case shall the assimilation or transport of pollutants be deemed a beneficial use.

Cold water fishery - Waters whose quality is capable of sustaining a year-round population of cold water trout (salmonidae).

Division - The Massachusetts Division of Water Pollution Control, as established by General Laws c.21, §26.

Discharge - Any addition of any pollutant to the waters of the Commonwealth.

EPA - The United States Environmental Protection Agency.

Federal Act - The Federal Water Pollution Control Act, as amended, 33 U.S.C. §§1251, et seq.

Massachusetts Act - The Massachusetts Clean Waters Act, as amended, General Laws, c.21, §§26-53, inclusive.

Pollutant - Any element or property of sewage, agricultural, industrial or commercial waste, runoff, leachate, heated effluent, or other matter, in whatever form and whether originating at a point or major nonpoint source, which is or may be discharged, drained or otherwise introduced into any sewerage system, treatment works or waters of the Commonwealth.

Primary contact recreation - Any recreation or other water use, such as swimming and water skiing, in which there is prolonged and intimate contact with the water sufficient to constitute a health hazard.

Seasonal cold water fishery - Waters whose quality is capable of sustaining only an extremely limited cold water population on a year-round basis, with cold-water fish in these streams provided largely by stocking.

Secondary contact recreation - Any recreation or other water use in which contact with the water is either incidental or accidental, such as fishing, boating and limited contact incident to shoreline activities.

Segment - A finite portion of a water body established by the Division for the purpose of classification.

Warm water fishery - Waters whose quality is not capable of sustaining a year-round cold water or seasonal cold water fishery.

Waters of the Commonwealth - All waters within the jurisdiction of the Commonwealth, including, without limitation, rivers, streams, lakes, ponds, springs, impoundments, estuaries and coastal waters, but not including groundwaters.

Regulation 1.6 Severability. If any provision of these standards is held invalid, the remainder of these standards shall not be affected thereby.

Regulation 1.7 Repealer. The "Rules and Regulations for the Establishment of Minimum Water Quality Standards and for the Protection of the Quality and Value of Water Resources" filed with the Secretary of the Commonwealth on May 2, 1974 and the "River Basin Classifications" filed with the Secretary of the Commonwealth on July 21, 1967 are hereby repealed, except that all permits, orders, determinations or other actions of the Division,

based upon such standards and river basin classifications, and any court actions seeking to enforce such standards, permits, orders and determinations shall remain in full force and effect until modified, amended, revoked or reissued by the Division and/or the courts of the Commonwealth, as appropriate.

Regulation 1.8 Effective Date. These standards shall become effective upon publication by the Secretary of the Commonwealth pursuant to the provisions of G.L. c.30A, §6.

PART 2 APPLICATION OF STANDARDS

Regulation 2.1 Establishment of Effluent Limitations. In regulating discharges of pollutants to waters of the Commonwealth, the Division will limit or prohibit such discharges to insure that the water quality standards of the receiving waters will be maintained or attained. The determination by the Division of the applicable level of treatment for an individual discharger will be made in the establishment of effluent limitations in the individual discharge permits. In establishing such effluent limitations, the Division must consider natural background conditions, protect existing downstream uses, and not interfere with the maintenance and attainment of beneficial uses in downstream waters. Toward this end, the Division may provide a reasonable margin of safety to account for any lack of knowledge concerning the relationship between the pollutants being discharged and their impact on the quality of the receiving waters.

Municipal discharges to inland waters and industrial discharges to all waters must provide minimum of secondary treatment or its industrial waste equivalent. In coastal and marine waters, municipal dischargers must provide a minimum of primary treatment plus disinfection. The above minimum treatment requirements will be increased where necessary to satisfy other state and federal laws and regulations or to achieve the water quality assigned in these regulations, whichever is the most stringent.

As used in this section, "secondary treatment" is that process or group of processes capable of removing from untreated wastewater a minimum of 85% of the 5 day biochemical oxygen demand and suspended solids, and virtually all floating and settleable solids, followed by disinfection. The "equivalent" treatment for industrial waste may generally be defined as that process or group of processes achieving maximum practicable removal of solids, oils, grease, acids, alkalis, toxic materials, bacteria, taste and odor causing materials, color and other objectionable constituents contained in untreated waste to produce an effluent equivalent to that obtained from secondary treatment of sewage or the effluent from the most efficient treatment facilities in current use for any specific category of industrial waste. Disinfection of treated effluent may be discontinued between October 15 and April 1 at the discretion of the Division. At the discretion of the Division, nitrification and/or phosphorus removal processes at municipal sewage treatment facilities may be seasonally discontinued.

Regulation 2.2 Mixing Zones. In applying these standards, the Division may recognize, where appropriate, a limited mixing zone or zone of initial dilution on a case-by-case basis. The location, size and shape of these zones shall provide for the maximum protection aquatic resources. At a minimum, mixing zones must:

a) Meet the criteria for aesthetics;

b) Be limited to an area or volume that will minimize interference with the designated uses or established community of aquatic life in the segment:

c) Allow an appropriate zone of passage for migrating fish and other organisms; and

d) Not result in substances accumulating in sediments, aquatic life or food chains to exceed known or predicted safe exposure levels for the health of humans or aquatic life.

Regulation 2.3 Hydrologic Conditions. The Division will determine the most severe hydrologic condition at which water quality standards must be met. In classifying the inland waters of the Commonwealth and in applying these standards to such waters, the critical low flow condition at and above which these standards must be met is the average minimum consecutive seven day flow to be expected once in ten years, unless otherwise stated by the Division in these standards. In artificially regulated waters, the critical low flow will be established by the Division through agreement with the Federal, state or private interest controlling the flow. The minimum flow established in such agreement will become the critical low flow under this section for those waters covered by the agreement.

Regulation 2.4 Procedures for Sampling and Analysis. For the purpose of collecting, preserving and analyzing samples in connection with these water quality standards, the fourteenth edition of Standard Methods for the Examination of Water and Wastewater published by the American Public Health Association, or Methods for Chemical Analysis of Water and Wastes published by the U.S. Environmental Protection Agency should be used. Where a method is not given in these publications, the latest procedures of the American Society for Testing Materials (ASTM) shall be used, or any other equivalent method approved by the Director.

PART 3 MINIMUM WATER QUALITY CRITERIA AND ASSOCIATED USES

Regulation 3.1 Description of Contents. This part sets forth the Classes to be used by the Division in classifying the waters of the Commonwealth according to the uses for which the waters shall be enhanced, maintained and protected. For each class, the most sensitive beneficial uses are identified and minimum criteria for water quality in the water column are established. The minimum criteria in Reg. 3.4 have been developed by applying the criteria contained in the EPA publication Quality Criteria for Water (EPA-440/9-76-023) to account for local conditions including, but not limited to:

a) The characteristics of the biological community

b) Temperature, weather and flow characteristics, and

c) Synergistic and antagonistic effects of combinations of pollutants.

Regulation 3.2 Coordination with Federal Criteria. The Division will use the EPA publication entitled Quality Criteria for Water, EPA-440/9-76-023 as guidance in establishing case-by-case discharge limits for pollutants not specifically listed in these standards but included under the heading "Other Constituents" in Regulation 3.4, for identifying bioassay application factors and for interpretations of narrative criteria. Where the minimum criteria specifically listed by the Division in this part differ from those contained in the federal criteria, the provisions of the specifically listed criteria in these standards shall apply.

Regulation 3.3 Classes and Designated Uses. The waters of the Commonwealth will be assigned to one of the classes listed below. Each class is defined by the most sensitive, and therefore governing, uses which it is intended to protect. The classes are:

Classes for Inland Waters

Class A - Waters assigned to this class are designated for use as a source of public water supply.

Class B - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; and for primary and secondary contact recreation.

Class C - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; and for secondary contact recreation.

Classes for Coastal and Marine Waters

Class SA - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting without depuration in approved areas.

Class SB - Waters assigned to this class are designated for the uses of protection and propagation of fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting with depuration (Restricted Shellfish Areas).

Class SC - Waters assigned to this class are designated for the protection and propagation of fish, other aquatic life and wildlife; and for secondary contact recreation.

Regulation 3.4 Minimum Criteria. The following minimum criteria are adopted and shall be applicable to all waters of the Commonwealth.

A. These minimum criteria are applicable to all waters of the Commonwealth, unless criteria specified for individual classes are more stringent.

Parameter	Criteria
1. Aesthetics	All waters shall be free from pollutants in concentrations or combinations that: a) Settle to form objectionable deposits; b) Float as debris, scum or other matter to form nuisances; c) Produce objectionable odor, color, taste or turbidity; or d) Result in the dominance of nuisance species.

2.	Radioactive Substances	Shall not exceed the recommended limits of the United States Enviornmental Protection Agency's National Drinking Water Regulations.
3.	Tainting Substances	Shall not be in concentrations or combinations that produce undesirable flavors in the edible portions of aquatic organisms.
4.	Color, Turbidity, Total Suspended Solids	Shall not be in concentrations or combinations that would exceed the recommended limits on the most sensitive receiving water use.
5.	Oil and Grease	The water surface shall be free from floating oils, grease and petrochemicals and any concentrations or combinations in the water column or sediments that are aesthetically objectionable or deleterious to the biota are prohibited. For oil and grease of petroleum origin the maximum allowable discharge concentration is 15 mg/1.
6.	Nutrients	Shall not exceed the site-specific limits necessary to control accelerated or cultural eutrophication.
7.	Other Constituents	Waters shall be free from pollutants in concentrations or combinations that a) Exceed the recommended limits on the most sensitive receiving water use; b) Injure, are toxic to, or produce adverse physiological or behavioral responses in humans or aquatic life; or c) Exceed site-specific safe exposure levels determined by bioassay using sensitive resident species.

B. Inland Waters - the following additional minimum criteria are applicalbe to inland water classifications.

For Class A waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/1 in warm water fisheries and a minimum of 6.0 mg/1 in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°c) in warm water fisheries or 68°F (20°c) in cold water fisheries nor shall the rise resulting from artificial origin exceed 4.0°F (2.2°c).
3.	pH	As naturally occurs.

4.	Total Coliform Bacteria	Shall not exceed a log mean for a set of samples of 50 per 100 ml during any monthly sampling period.
5.	Turbidity	None other than of natural origin.
6.	Total Dissolved Solids	Shall not exceed 500 mg/1.
7.	Chlorides	Shall not exceed 250 mg/1.
8.	Sulfates	Shall not exceed 250 mg/1.
9.	Nitrate	Shall not exceed 10 mg/1 as nitrogen.

For Class B waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/1 in warm water fisheries and a minimum of 6.0 mg/1 in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°c) in warm water fisheries or 68°F (20°c) in cold water fisheries, nor shall the rise resulting from artificial origin exceed 4.0°F (2.2°c).
3.	pH	Shall be in the range of 6.5 - 8.0 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 200 per 100 ml, nor shall more than 10% of the total samples exceed 400 per 100 ml during any monthly sampling period, except as provided in Regulation 2.1

For Class C waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 5.0 mg/1 in warm water fisheries and a minimum of 6.0 mg/1 in cold water fisheries.
2.	Temperature	Shall not exceed 83°F (28.3°c) in warm water fisheries or 68°F (20°c) in cold water fisheries, nor shall the rise resulting from artificial origin exceed 4.0°F (2.2°c).

3.	pH	Shall be in the range of 6.5-9.0 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 1000 per 100 ml, nor shall more than 10% of the total samples exceed 2,500 per 100 ml during any monthly sampling period, except as provided in Regulation 2.1.

C. Coastal and Marine Waters - the following additional minimum criteria are applicable to coastal and marine waters.

For Class SA waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 6.0 mg/l.
2.	Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.
3.	pH	Shall be in the range of 6.5-8.5 standard units and not more than 0.2 units outside of the naturally occurring range.
4.	Total Coliform Bacteria	Shall not exceed a median value of 70 MPN per 100 ml and not more than 10% of the samples shall exceed 230 MPN per 100 ml in any monthly sampling period.

For Class SB waters:

	Parameter	Criteria
1.	Dissolved Oxygen	Shall be a minimum of 6.0 mg/l.
2.	Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.
3.	pH	Shall be in the range of 6.5-8.5 and not more than 0.2 units outside of the naturally occurring range.
4.	Total Coliform Bacteria	Shall not exceed a median value of 700 MPN per 100 ml and not more than 20% of the samples shall exceed 1000 MPN per 100 ml during any monthly sampling period, except as provided in Regulation 2.1.

For Class SC waters:

Parameter	Criteria
1. Dissolved Oxygen	Shall be a minimum of 6.0 mg/1.
1. Temperature	None except where the increase will not exceed the recommended limits on the most sensitive water use.
3. pH	Shall be in the range of 6.5-8.5 standard units and not more than 0.2 units outside the naturally occurring range.
4. Fecal Coliform Bacteria	Shall not exceed a log mean for a set of samples of 1000 MPN per 100 ml, nor shall more than 10% of the total samples exceed 2500 MPN per 100 ml during any monthly sampling period, except as provided in Regulation 2.1.

PART 4 ANTIDEGRADATION PROVISIONS

Regulation 4.1 Protection of Existing Uses. In all cases, from and after the date these regulations become effective, the quality of the waters of the Commonwealth shall be maintained and protected to sustain existing beneficial uses.

Regulation 4.2 Protection of High Quality Waters. From and after the date these regulations become effective, waters designated by the Division in Regulation 5.5 whose quality is or becomes consistantly higher than that quality necessary to sustain the national goal uses shall be maintained at that higher level of quality unless limited degradation is authorized by the Division. Limited degradation may be allowed by the Division as a variance from this regulation as provided in Section 4.6.

Regulation 4.3 Protection of Low Flow Waters. Certain waters will be designated by the Division in Regulation 5.5 of these standards for protection under this section due to their inability to accept pollutant discharges. New or increased discharges of pollutants to waters so designated are prohibited unless a variance is granted by the Division as provided in Regulation 4.6.

Regulation 4.4 National Resource Waters. Waters which constitute an outstanding national resource as determined by their outstanding recreational, ecological and/or aesthetic values shall be preserved. These waters shall be designated for preservation by the Division in Regulation 5.5 of these standards. Waters so designated may not be degraded and are not subject to a variance procedure. New discharges of pollutants to such waters are prohibited. Existing discharges shall be eliminated unless the discharger is able to demonstrate that:

a) Alternative means of disposal are not reasonably available or feasible; and

b) The discharge will not affect the quality of the water as a national resource.

Regulation 4.5 Control of Eutrophication. The discharge of nutrients, primarily phosphorus or nitrogen, to waters of the Commonwealth will be limited or prohibited by the Division as necessary to prevent excessive eutrophication of such waters. There shall be no new or increased discharges of nutrients into lakes and ponds, or tributaries thereto. Existing discharges containing nutrients which encourage eutrophication or growth of weeds or algae shall be treated. Activities which may result in non-point discharges of nutrients shall be conducted in accordance with the best management practices reasonably determined by the Division to be necessary to preclude or minimuze such discharges of nutrients.

Regulation 4.6 Variances. A variance to authorize a discharge in water designated for protection under regulation 4.2 may be allowed by the Division where the applicant demonstrates that:

1) The proposed degradation will not result in water quality less than specified for the class; and

2) The adverse economic and social impacts specifically resulting from imposition of controls more stringent than secondary treatment to maintain the higher water quality are substantial and widespred in comparision to other economic factors and are not warranted by a comparison of the economic, social and other benefits to the public resulting from maintenance of the higher quality water.

In addition to the above, the applicant for a variance to authorize a discharge into waters designated for protection under Regulation 4.3 must demonstrate that:

3) Alternative means of disposal are not reasonably available or feasible.

In any proceeding where such variance is at issue, the Division shall circulate a public notice in accordance with the procedures set forth in G.L. c30A, §3. Said notice shall state that a variance is under consideration by the Division, and indicate the Director's tentative determination relative thereto. To the extent feasible, the variance proceeding shall be conducted as part of any pending discharge permit proceedings pursuant to G.L. c.21, §43. In any variance procedure, the burden of proof relative to justifying the variance shall be on the party requesting the variance. Any variance granted pursuant to this regulation shall not extend beyond the expiration date of the permit.

PART 5 BASIN CLASSIFICATIONS AND MAPS

Regulation 5.1 Description of Contents. This part sets forth the procedures and guidelines the Division must follow in classifying the waters of the Commonwealth, and the classifications themselves. The procedural rules for classifying are contained in Regulations 5.2 through 5.4. Regulation 5.5 contains maps and tabulations identifying the assignment by the Division of each segment to one of the classes set forth in Part 3.3 of these Standards, the designation of uses and associated criteria for that segment and the imposition of special limitations in regulations 4.2, 4.3 and 4.4 to that segment.

Regulation 5.2 Designation of Uses. In determining the appropriate classification for a particular water, the Division must fulfill its statutory mandate as set forth in Regulation 1.4 of these standards. Wherever attainable, the Division shall designate the national goal uses of protection and propagation of fish, shellfish, aquatic life and wildlife and recreation in and on the waters in classifying the waters of the Commonwealth. In determining whether the national goal uses are attainable for a given water, the Division has considered limitations imposed by natural conditions, irreversible artificial conditions and the availability of feasible technological treatment methods and designated the optimum number of beneficial uses attainable in the circumstances.

Regulation 5.3 Other Applicable Standards. Waters classified by the Division in this part may be subject to additional restrictions pursuant to federal or Massachusetts statutes and regulations. Where such additional restrictions are known they are noted in the classifications in this part. Where these restrictions impose requirements more stringent than required under the Massachusetts or Federal Acts, e.g. public health restrictions relative to water supplies, such restrictions shall be considered and applied by the Division in classifying the waters to the extent authorized in the Massachusetts Act.

Regulation 5.4 Fisheries Designations. For inland waters certain specific criteria become applicable on the basis of their designation as a particular type of fishery. Therefore, inland segments are designated as cold water, seasonal cold water or warmwater fisheries. In seasonal cold water fisheries criteria for cold water fisheries apply during the period of September 15 through June 30 annually, and criteria for warm water fisheries apply at all other times.

Where the Division determines that natural conditions prevent the attainment of water quality capable of supporting a warm water fishery, a use designation of aquatic life has been made. In each segment so designated in Regulation 5.5, the criteria for a warm water fishery apply for all constituents except those affected by the natural condition, which constituents shall be governed by the most sensitive resident species as determined by the Director in consultation with the Massachusetts Division of Fisheries and Game.

Regulation 5.5 Classifications. For the purpose of applying the Massachusetts Water Quality Standards, the waters of the Commonwealth are hereby classified as shown in the following tables which are a part of these regulations. Columns 1 and 2 of the tables describes the segment. Column 3 identifies the applicable classification of the segment. Column 4 identifies the use or uses for which the segment is designated; (P&S) means primary and secondary contact recreation, (Sn) means seasonal fishery, (0) means open shellfishing, (R) means restricted shellfishing. Column 5 identifies the applicable provisions of Part 4 and Regulatin 5.3.

Segments and their classifications are shown on maps for general orientation. In case of inconsistancy between the tables and the maps, the data contained in the table shall control.

APPENDIX 2

LAKE CLASSIFICATION SYSTEM

The Division of Water Pollution Control has developed a lake classification system as an aid to setting priorities for the Lake Restoration Program (Section 314 of PL92-500) in Massachusetts. This system is generally applied only to those lakes for which the Division has collected water quality data. Although a host of physical, chemical, and biological parameters are measured during the normal lake survey, only six critical parameters are employed in the lake classification priority system. The six parameters are hypolimnetic dissolved oxygen, secchi disc reading, phytoplankton count, total ammonia- and nitrate-nitrogen, total phosphorus, and aquatic macrophyton. The most recent survey data are used and the priority listing is updated annually. The optimum season for collecting lake data is mid- to late summer, or during peak biological production. Unfortunately, this cannot always be achieved, thus spring or autumnal data have to be used in the lake classification system.

The limits used for awarding severity points for the six parameters have been based on several considerations and information sources. These include lake classifications of other states, the natural range of parameters in Massachusetts, limnological texts, and accepted indices of eutrophication reported in the literature. The severity point system has been formulated as follows:

PARAMETER	CONCENTRATION OR DEGREE OF SEVERITY	POINTS
Hypolimnetic dissolved oxygen	≥5.0 mg/l	0
	<5.0-3.0 mg/l	1
	<3.0-1.0 mg/l	2
	<1.0 mg/l	3
Transparency (secchi disc reading)	≥15 feet	0
	<15-10 feet	1
	<10-4 feet	2
	<4 feet*	3
Phytoplankton	0-500 ASU or natural units/ml	0
	>500-1000 ASU or natural units/ml	1
	>1000-1500 ASU or natural units/ml	2
	>1500 ASU or summer "blooms"	3
Epilimnetic NH_3 + NO_3-N	0-<0.15 mg/l	0
	≥0.15-0.3 mg/l	1
	>0.3-0.5 mg/l	2
	>0.5 mg/l	3
Epilimnetic total phosphorus	0-0.01 mg/l	0
	>0.01-0.05 mg/l	1
	>0.05-0.10 mg/l	2
	>0.10 mg/l	3

*Four feet is the minimum allowable transparency at bathing beaches, as stated in Article VII of the State Sanitary Code.

PARAMETER	CONCENTRATION OR DEGREE OF SEVERITY	POINTS
Aquatic Vegetation	Sparse	0
	Medium	1
	Dense	2
	Very dense	3

It is expected that chlorophyll a data will soon augment or replace the phytoplankton data as they become part of the routine lake survey. The severity points may be interpreted as follows:

0 = No problem. Considered to be representative of clean water quality.

1 = Slight problem; borderline case considered to be potentially degrading.

2 = Definite problem. Considered unacceptable for lake water quality.

3 = Severe problem, undoubtedly causing degradation of the lake's water quality or some recreational uses.

Lakes, ponds, and reservoirs are first divided into two major categories:

1) Those which stratify during the summer;

2) Those which do not stratify during the summer.

Next, severity points are assigned to each of the above critical parameters. On the basis of the severity point system, a priority listing can be maintained. This listing, in conjunction with other available data, can then be used for a trophic level classification system. On the basis of a possible 18 severity points, the trophic level index would be as follows:

0 - 6	oligotrophic
6 - 12	mesotrophic
12 - 18	eutrophic

The overlap of severity points is intentional and meant to underscore the system's flexibility. The general range of severity points is considered more important than the absolute total for a given lake.

Although the system is not 100% equitable, it does appear to give a fair representation of lake trophic conditions for the vast majority of Massachusetts' lakes. River impoundments below point waste discharges present special cases. Personal knowledge of these situations helps explain anomalies in the data. By its very nature, the system cannot be static but will be under constant reevaluation as new data become available.

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